

## BAB VI

### KESIMPULAN DAN SARAN

#### 6.1. Kesimpulan

Dari penjelasan tentang tugas akhir ini yang sudah diberikan pada bab-bab sebelumnya maka dapat ditarik kesimpulan sebagai berikut :

1. Ditinjau dari segi waktu dan tenaga

Akan lebih efisien bila menggunakan perangkat lunak Analisis Balok Beton Prategang Dukungan Sederhana ini untuk melakukan perhitungan atau analisis beton prategang (khusus untuk *simple beam*), dibandingkan dengan perhitungan manual.

2. Ditinjau dari segi tingkat ketelitian dan kepresisian perhitungan

Tingkat ketelitian dan kepresisian perhitungan perangkat lunak ini lebih tinggi apabila dibandingkan dengan perhitungan manual. Hal ini dapat dilihat dari perbandingan hasil perhitungan analisis secara manual dan analisis menggunakan perangkat lunak, menunjukkan adanya selisih. Selisih ini karena perbedaan dalam pembulatan dimana cara manual seringkali hanya 4 angka dibelakang koma, sedangkan perangkat lunak ini sampai 20 angka, hanya pada hasil akhir pembulatan 4 angka dibelakang koma dilakukan.

3. Dengan perangkat lunak Analisis Balok Beton Prategang Dukungan Sederhana semua orang dapat melakukan analisis balok prategang

dukungan sederhana tanpa harus mempunyai keahlian khusus dalam hal beton prategang.

## 6.2. Saran

Pada perangkat lunak Analisis Balok Beton Prategang Dukungan Sederhana ini masih dapat dikembangkan lebih lanjut, misalnya dengan menambahkan pada *form input* dan *output* data-data proyek yang dianalisis, serta pengembangan dalam jaringan komputer (LAN dan Internet)

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# LAMPIRAN

### Contoh Perhitungan Analisis Tegangan Geser Balok Tampang T Tipe 1

#### 1. Perhitungan dengan cara manual

Diketahui :  $h_t = 950 \text{ mm}$

$f_c = 40 \text{ MPa}$

$b_w = 200 \text{ mm}$

$f_y = 300 \text{ MPa}$

$b_{of} = 800 \text{ mm}$

$L = 20000 \text{ mm}$

$d_{fa} = 150 \text{ mm}$

$E_s = 197400$

$d_s = 80 \text{ mm}$

$E_c = 28200$

$f_{ps} = 1200 \text{ MPa}$

$\gamma_{\text{beton}} = 24 \text{ KN/m}^3$

$A_{ps} = 1000 \text{ mm}^2$

$q_h = 8 \text{ KN/m}$

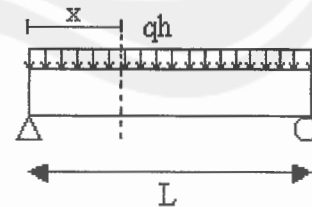
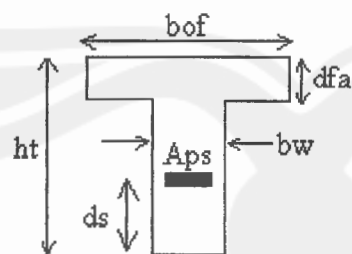
$q_m = 2 \text{ KN/m}$

$\Delta f_{ps} = 240 \text{ MPa}$

$f_{pu} = 1800 \text{ MPa}$

$\phi_{\text{sengkang}} = 10 \text{ mm}$

$x = 5000 \text{ mm}$



Ditanyakan : Tegangan geser balok

Penyelesaian :

$$f_{pse} = 1200 - 240 = 960 \text{ MPa}$$

$$n = 197400 / 28200 = 7$$

$$A_c = (200 \times 950) + (150 \times 600) = 280000 \text{ mm}^2$$

$$Q = [(200 \times 950) \times 0] + [(150 \times 600) \times 400] = 36000000 \text{ mm}^3$$

$$Y1 = 36000000 / 280000 = 128.5714 \text{ mm}$$

$$Ya = (950/2) - 128.5714 = 346.4285 \text{ mm}$$

$$Yb = (950/2) + 128.5714 = 603.5714 \text{ mm}$$

$$Y2 = 346.4285 - (150/2) = 271.4285 \text{ mm}$$

$$e = 603.5714 - 80 = 523.5714 \text{ mm}$$

$$It = [(1/12) \times 200 \times (950)^3] + [200 \times 950 \times (128.5714)^2] + [(1/12) \times 600 \times (150)^3] + [600 \times 150 \times (271.4285)^2]$$

$$It = 2.4230 \times 10^{10} \text{ mm}^4$$

Momen inersia terhadap titik berat tendon diabaikan !

$$\text{Berat sendiri} = (280000/10^6) \times 24 = 6.72 \text{ KN/m}$$

$$\text{Beban mati wajib} = 2 \text{ KN/m}$$

$$Vd = (0.5 \times 6.72 \times 20) - (6.72 \times 5) = 33.6 \text{ KN}$$

$$\text{Beban luar berfaktor} = W = (1.2 \times 2) + (1.6 \times 8) = 15.2 \text{ KN}$$

$$Vi = (0.5 \times 15.2 \times 20) - (15.2 \times 5) = 76 \text{ KN}$$

$$d = 950 - 80 = 870 \text{ mm}$$

$$d = 950 \times 0.8 = 760 \text{ mm}$$

$$\text{Dipakai } d = 870 \text{ mm}$$

$$M_{\max} = (0.5 \times 15.2 \times 20 \times 5) - (0.5 \times 15.2 \times 5^2) = 570 \text{ KN-m}$$

Menghitung Mcr

$$N = 1000 \times 960 = 960000 \text{ N}$$

$$f_{pe} = |(960000/280000) + (960000 \times 523.5714 \times 603.5714) / (2.4230 \times 10^8)|$$

$$= 15.9492 \text{ MPa}$$

$$M_d = (0.5 \times 6.72 \times 20 \times 5) - (0.5 \times 6.72 \times 5^2) = 252 \text{ KN-m}$$

$$f_d = (252 \times 603.5714) / (2.4230 \times 10^8) = 6.2774 \text{ Mpa}$$

$$M_{cr} = ((2.4230 \times 10^8) / 603.5714) \times \{ (0.5 \times \sqrt{40}) + 15.9492 - 6.2774 \}$$

$$= 515.211513 \text{ KN-m}$$

$$V_{ci} = (1/20 \times \sqrt{40} \times 200 \times 870) + 33600 + \{ (76000 \times 515.211513) / (570 \times 10^6) \}$$

$$= 157.3185 \text{ KN}$$

$$V_{ci} = 1/7 \times \sqrt{40} \times 200 \times 870 = 157.21037 \text{ KN}$$

$$\text{Dipakai } V_{ci} = 157.3185 \text{ KN}$$

$$f_{pc} = 960000 / 2800000 = 3.4285 \text{ MPa}$$

$$V_{cw} = 0.3 \times (\sqrt{40} + 3.4285) \times 200 \times 870 = 509.1132 \text{ KN}$$

$$V_c = 157.3185 \text{ KN (dipakai } V_{ci} \text{ atau } V_{cw} \text{ yang terkecil)}$$

Kebutuhan sengkang

$$q_v = (1.2 \times (6.72 + 2)) + (1.6 \times 8) = 23.246 \text{ KN/m}$$

$$V_u = (0.5 \times 23.246 \times 20) - (23.246 \times 5) = 116.32 \text{ KN}$$

$$\phi V_c = 0.6 \times 157.3185 = 94.3911 \text{ KN}$$

$$V_s = (116.32 / 0.6) - 157.3185 = 36.5482 \text{ KN}$$

$$V_{s \text{ max}} = 2/3 \times \sqrt{40} \times 200 \times 870 = 733.64 \text{ KN}$$

$$V_s < V_{s \text{ max}} \rightarrow \text{OK !}$$

Dipakai begel 2 $\phi$  10

$$A_v = 2 \times 0.25 \times \pi \times 10^2 = 157 \text{ mm}^2$$

$$S = (157 \times 300 \times 870) / 36548.2 = 1121.18 \text{ mm}$$

$$S = 0.75 \times 950 = 712.5 \text{ mm}$$

$$S = 600 \text{ mm}$$

$$S_{\max} = 600 \text{ mm (dipakai } S \text{ yang terkecil)}$$

$$AV_{\min} = (200 \times 600) / (3 \times 300) = 133.3333 \text{ mm}^2$$

$$AV_{\min} = (1000 \times 1800 \times 600) / (80 \times 300 \times 870) \times \sqrt{(870 / 200)} \\ = 107.88 \text{ mm}^2$$

$$AV = 133.3333 \text{ mm}^2 \text{ (dipakai } AV_{\min} \text{ yang terbesar)}$$

Perbandingan hasil perhitungan analisis kekuatan geser dengan cara perhitungan manual dan dengan menggunakan perangkat lunak Analisis Balok Beton Prategang Dukungan Sederhana adalah sebagai berikut :

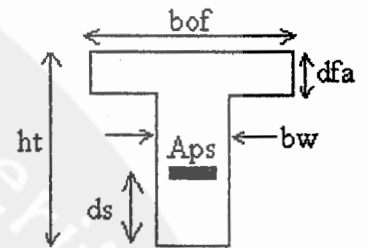
Analisis	Cara Manual	Dengan Perangkat Lunak	Kesalahan ( % )
Momen penyebab retak ( $M_{cr}$ )	515.2115	518.9442	0.7245
Geser yang dipikul beton ( $V_c$ )	157.3185	158.5362	0.7740
Kekuatan geser ultimit ( $V_u$ )	116.32	117.1840	0.7427
Geser yang dipikul baja ( $V_s$ )	36.5482	36.7705	0.6082
Luas sengkang minimal ( $A_v \min$ )	133.3333	133.3333	0
Jarak sengkang maksimal ( $S_{\max}$ )	600.0000	600.0000	0



### Hasil Perhitungan Analisis Kekuatan Geser Pada Balok Tampang T Tipe 1

#### Input Data :

- |                    |                           |                          |
|--------------------|---------------------------|--------------------------|
| 1. $h_t = 950$     | 8. $f_c = 40$             | 15. $\gamma$ beton = 24  |
| 2. $b_w = 200$     | 9. $L = 20000$            | 16. $f_y = 300$          |
| 3. $b_{of} = 800$  | 10. $E_s = 197400$        | 17. $f_{pu} = 1800$      |
| 4. $d_{fa} = 150$  | 11. $E_c = 28200$         | 18. $q_m = 2$            |
| 5. $A_{ps} = 1000$ | 12. $x = 5000$            | 19. $\phi$ sengkang = 10 |
| 6. $d_s = 80$      | 13. $q_h = 8$             |                          |
| 7. $f_{ps} = 1200$ | 14. $\Delta f_{ps} = 240$ |                          |



#### Hasil Perhitungan :

- |                                                                |                 |
|----------------------------------------------------------------|-----------------|
| 1. Momen penyebab retak ( $M_{cr}$ ) = 518.9442                | kN-m            |
| 2. Geser total yang dipikul oleh beton ( $V_c$ ) = 158.5362    | kN              |
| 3. Kekuatan geser batas ultimit ( $V_u$ ) = 117.1840           | kN              |
| 4. Geser total yang dipikul baja ( $V_s$ ) = 36.7705           | kN              |
| 5. Luasan melintang sengkang minimal ( $A_{vmin}$ ) = 133.3333 | mm <sup>2</sup> |
| 6. Jarak sengkang maksimal ( $S_{max}$ ) = 600.0000            | mm              |

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# LISTING PROGRAM

## Listing Program

```
unit InAngkur_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, jpeg;
type
  Tangkur_t2 = class(TForm)
    Label2: TLabel;
    Label3: TLabel;
    Label5: TLabel;
    Label6: TLabel;
    Label7: TLabel;
    Label8: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    Label11: TLabel;
    Label12: TLabel;
    Label13: TLabel;
    Label4: TLabel;
    Label14: TLabel;
    Label15: TLabel;
    Label16: TLabel;
    Label17: TLabel;
    Label18: TLabel;
    Label36: TLabel;
    Label19: TLabel;
    Label20: TLabel;
    Label21: TLabel;
    Label22: TLabel;
    Label23: TLabel;
    Label24: TLabel;
    Label25: TLabel;
    Label26: TLabel;
    Label27: TLabel;
    Label28: TLabel;
    Label29: TLabel;
    Label30: TLabel;
    Panel1: TPanel;
    Label31: TLabel;
    Panel2: TPanel;
    Image1: TImage;
    edtbw: TEditEx;
    edtht: TEditEx;
    edtbfof: TEditEx;
    edta: TEditEx;
    edtb: TEditEx;
    edtdfa: TEditEx;
    edtAps: TEditEx;
    edtds: TEditEx;
    edtfps: TEditEx;
    edtfci: TEditEx;
    edtbp: TEditEx;
    edthp: TEditEx;
    edtL: TEditEx;
    edtEs: TEditEx;
    edtEc: TEditEx;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolSimpan: TBitBtn;
    tombolAnalisis: TBitBtn;
    SaveDialog1: TSaveDialog;
    Label1: TLabel;
    Label33: TLabel;
    edtfy: TEditEx;
    lblJudul: TLabel;
    procedure tombolAnalisisClick(Sender: TObject);
    procedure tombolBantuanClick(Sender: TObject);
    procedure tombolKembaliClick(Sender: TObject);
```

## Listing Program

```

procedure tombolSimpanClick(Sender: TObject);
private
  PraOrPasca: string;
public
  procedure Eksekusi(PraAtauPasca: string);
end;
var
  angkur_t2: Tangkur_t2;
implementation
  uses OtAngkur_t2, Menu_Bantuan;
  procedure Tangkur_t2.tombolAnalisisClick(Sender: TObject);
  var
    ht, ds, fps, Aps, bof, dfa, bw, L, a, b, fci, hp, bp, Es, Ec, fy: Extended;
    At, Q, Ya, Yb, Fo, Br6, Br7, Br9, Br10, Br11, Br12, Br13: Extended;
    Hsl1, Hsl2, Hsl3, Pesan1, Satu2, Satu3: string;
  begin
    with angkur_t2 do begin
      ht := edtht.Value;
      ds := edtds.Value;
      fps := edtfps.Value;
      Aps := edtAps.Value;
      fci := edtfci.Value;
      fy := edtfy.Value;
      hp := edthp.Value;
      bp := edtbp.Value;
      Es := edtEs.Value;
      Ec := edtEc.Value;
      dfa := edtdfa.Value;
      bof := edtbof.Value;
      bw := edtbw.Value;
      L := edtL.Value;
      a := edta.Value;
      b := edtb.Value;

      At := (bof - bw) * dfa + bw * ht + a * b + ((Es / Ec) - 1) * Aps;
      Q := (bof - bw) * dfa * (dfa / 2) + (bw * ht * (ht / 2)) + a * b * (dfa + (b / 3)) + ((Es / Ec) - 1) * Aps * (ht - ds);
      Ya := Q / At;
      Yb := ht - Ya;
      Fo := fps * Aps;
      Br6 := Fo / At;
      Br7 := Br6 * bw;
      Br9 := Fo / bp;
      Br10 := ((Br7 * Sqr(Yb)) / 2) - ((Br9 * Sqr(hp / 2)) / 2);
      Br11 := (7.2 * Br10) / (bw * Sqr(1.3 * ht));
      Hsl1 := '1. Tegangan tarik pada daerah angkur = ' + Format('%4f', [Br11]);
      if (Br11 < (0.17 * Sqr(fci))) then
        begin
          Pesan1 := 'Hasil hitungan < 0.17 * Sqr(fci) -> Sudah sesuai peraturan';
        end
      else
        begin
          Pesan1 := 'Hasil hitungan > 0.17 * Sqr(fci) -> Tidak sesuai peraturan';
          Satu2 := 'N';
          Satu3 := 'mm2';
          Br12 := (2.6 * Br10) / (1.3 * ht);
          Hsl2 := '2. Gaya tarik pada daerah angkur = ' + Format('%4f', [Br12]);
          Br13 := Br12 / fy;
          Hsl3 := '3. Luas tulangan baja yang diperlukan = ' + Format('%4f', [Br13]);
        end;
    end;

  end;

  with Ot_Angkur_t2 do begin
    lblht.Caption := '1. ht = ' + FloatToStr(ht);
    lblds.Caption := '6. ds = ' + FloatToStr(ds);
    lblfps.Caption := '7. fps = ' + FloatToStr(fps);
    lblAps.Caption := '5. Aps = ' + FloatToStr(Aps);
    lblfci.Caption := '8. fci = ' + FloatToStr(fci);
    lblES.Caption := '11. Es = ' + FloatToStr(Es);
  end;

```

## Listing Program

```

lblEc.Caption := ' 12. Ec = ' + FloatToStr(Ec);
lblhp.Caption := ' 9. hp = ' + FloatToStr(hp);
lblbp.Caption := ' 10. bp = ' + FloatToStr(bp);
lblbw.Caption := ' 3. bw = ' + FloatToStr(bw);
lblbof.Caption := ' 2. bof = ' + FloatToStr(bof);
lbldfa.Caption := ' 4. dfa = ' + FloatToStr(dfa);
lblL.Caption := ' 13. L = ' + FloatToStr(L);
lbla.Caption := ' 15. a = ' + FloatToStr(a);
lblb.Caption := ' 16. b = ' + FloatToStr(b);
lblfy.Caption := ' 14. fy = ' + FloatToStr(fy);

lblHasil1.Caption := Hsl1;
lblHasil2.Caption := Hsl2;
lblHasil3.Caption := Hsl3;
lblPesan1.Caption := Pesan1;
lblSatu2.Caption := Satu2;
lblSatu3.Caption := Satu3;
ShowModal;
end;
end;

procedure Tangkur_t2.tombolBantuanClick(Sender: TObject);
begin
  frmmenu_bantuan.ShowModal;
end;

procedure Tangkur_t2.tombolKembaliClick(Sender: TObject);
begin
  Close;
end;

procedure Tangkur_t2.Eksekusi(PraAtauPasca: string);
begin
  PraOrPasca := PraAtauPasca;
  if (PraAtauPasca = 'Pra') then
    lblJudul.Caption := ' Tegangan Daerah Angkur Balok Pra-Tarikan Tampang T Tipe 2'
  else
    lblJudul.Caption := 'Tegangan Daerah Angkur Balok Pasca-Tarikan Tampang T Tipe 2';
  ShowModal;
end;

procedure Tangkur_t2.tombolSimpanClick(Sender: TObject);
var
  LstSimpan: TStringList;
begin
  LstSimpan := TStringList.Create;
  if PraOrPasca = 'Pra' then begin
    LstSimpan.Add('1');
    LstSimpan.Add('5');
    LstSimpan.Add('5');
    LstSimpan.Add('1');
  end else begin
    LstSimpan.Add('1');
    LstSimpan.Add('5');
    LstSimpan.Add('5');
    LstSimpan.Add('2');
  end;
  LstSimpan.Add(edtht.Text);
  LstSimpan.Add(edtds.Text);
  LstSimpan.Add(edtfps.Text);
  LstSimpan.Add(edtAps.Text);
  LstSimpan.Add(edtfci.Text);
  LstSimpan.Add(edtfy.Text);
  LstSimpan.Add(edthp.Text);
  LstSimpan.Add(edtbp.Text);
  LstSimpan.Add(edtEs.Text);
  LstSimpan.Add(edtEc.Text);
  LstSimpan.Add(edtdfa.Text);
  LstSimpan.Add(edtbof.Text);

```

## Listing Program

```
LstSimpan.Add(edtbw.Text);  
LstSimpan.Add(edtL.Text);  
LstSimpan.Add(edta.Text);  
LstSimpan.Add(edtb.Text);  
if SaveDialog1.Execute then  
    LstSimpan.SaveToFile(SaveDialog1.FileName);  
LstSimpan.Free;  
end;  
end.
```



## Listing Program

```
unit InGesar_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math, jpeg;
type
  Tgeser_t2 = class(TForm)
    Label3: TLabel;
    Label6: TLabel;
    Label7: TLabel;
    Label8: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    Label11: TLabel;
    Label4: TLabel;
    Label15: TLabel;
    Label16: TLabel;
    Label17: TLabel;
    Label2: TLabel;
    Label5: TLabel;
    Label18: TLabel;
    Label19: TLabel;
    Label21: TLabel;
    Label28: TLabel;
    Label29: TLabel;
    Label32: TLabel;
    Label33: TLabel;
    Label12: TLabel;
    Label24: TLabel;
    Label13: TLabel;
    Label14: TLabel;
    Label20: TLabel;
    Label22: TLabel;
    Label23: TLabel;
    Label25: TLabel;
    Label26: TLabel;
    Label27: TLabel;
    Label30: TLabel;
    Label31: TLabel;
    Label34: TLabel;
    Label35: TLabel;
    Label36: TLabel;
    Label37: TLabel;
    Panel1: TPanel;
    Label1: TLabel;
    Panel2: TPanel;
    Image1: TImage;
    edtbw: TEditEx;
    edtht: TEditEx;
    edtdfa: TEditEx;
    edtbfof: TEditEx;
    edtAps: TEditEx;
    edtds: TEditEx;
    edtfps: TEditEx;
    edtfc: TEditEx;
    edtL: TEditEx;
    edtEs: TEditEx;
    edtx: TEditEx;
    edtqh: TEditEx;
    edtgbeton: TEditEx;
    edtDfps: TEditEx;
    edtEc: TEditEx;
    edta: TEditEx;
    edtb: TEditEx;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolSimpan: TBitBtn;
```

## Listing Program

```

tombolAnalisis: TBitBtn;
SaveDialog1: TSaveDialog;
Label38: TLabel;
Label39: TLabel;
edtfpu: TEditEx;
Label41: TLabel;
Label42: TLabel;
edtfy: TEditEx;
Label43: TLabel;
Label44: TLabel;
edtdm: TEditEx;
Label45: TLabel;
Label47: TLabel;
Label48: TLabel;
edtDsengkang: TEditEx;
Label46: TLabel;
lblJudul: TLabel;
procedure tombolAnalisisClick(Sender: TObject);
procedure tombolBantuanClick(Sender: TObject);
procedure tombolKembaliClick(Sender: TObject);
procedure tombolSimpanClick(Sender: TObject);
private
  PraOrPasca: string;
public
  procedure Eksekusi(PraAtauPasca: string);
end;
var
  geser_t2: Tgeser_t2;
implementation
uses Menu_Bantuan, OtGeser_t2;
procedure Tgeser_t2.tombolAnalisisClick(Sender: TObject);
var
  ht, bw, bof, dfa, ds, fps, Aps, a, b, fpu, fy, qm, Dsengkang, fc, L, x, gbeton, qh, Es, Ec, Dfps: Extended;
  At, Q, Ya, Yb, Lo, It, Fo, fpse, fpc, qbs, Vd, W, Vi, d1, d2, d, Mmax, fpe, Md, fd,
  Mcr, Vci1, Vci2, Vci, Vcw, qv, Vu, Vs, Vc, Vsmax, S1, S2, Smax1, Smax2, SAvmin1, Avmin2, Av: Extended;
  Hsl1, Hsl2, Hsl3, Hsl4, Hsl5, Hsl6: string;
begin
  with geser_t2 do begin
    ht := edtht.Value;
    bw := edtbw.Value;
    bof := edtbof.Value;
    dfa := edtdfa.Value;
    ds := edtds.Value;
    fps := edtfps.Value;
    Aps := edtAps.Value;
    fc := edtfc.Value;
    fy := edtfy.Value;
    fpu := edtfpu.Value;
    x := edtx.Value;
    L := edtL.Value;
    gbeton := edtgbeton.Value;
    qh := edtqh.Value;
    qm := edtdm.Value;
    Es := edtEs.Value;
    Ec := edtEc.Value;
    Dfps := edtDfps.Value;
    Dsengkang := edtDsengkang.Value;
    a := edta.Value;
    b := edtb.Value;

    At := (bof - bw) * dfa + bw * ht + ((Es / Ec) - 1) * Aps + a * b;
    Q := ((bof - bw) * dfa * (dfa / 2)) + (bw * ht * (ht / 2)) + (a * b * (dfa + (b / 3))) + ((Es / Ec) - 1) * Aps * (ht - ds));
    Ya := Q / At;
    Yb := ht - Ya;
    Lo := Yb - ds;
    It := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht *
    Sqr(ht / 2)) + (2 * (a * Power(b, 3) / 36) + a * b * Sqr(dfa + (b / 3)))) + ((Es / Ec) - 1) * Aps * (Sqr(ht - ds))) - At *
    Sqr(Ya);
    fpse := fps - Dfps;

```



## Listing Program

```

qbs := At * gbeton * 1E-6;
Vd := (0.5 * qbs * (L * 1E-3)) - (qbs * (x * 1E-3));
W := (1.2 * qm) + (1.6 * qh);
Vi := (0.5 * W * (L * 1E-3)) - (W * (x * 1E-3));
d1 := ht - ds;
d2 := 0.8 * ht;
if d1 > d2 then
  d := d1
else
  d := d2;
Mmax := (0.5 * W * (L * 1E-3) * (x * 1E-3)) - (0.5 * W * Sqr(x * 0.001));
Fo := Aps * fpse;
fpe := Abs((Fo / At) + ((Fo * Lo * Yb) / It));
Md := (0.5 * qbs * (L * 1E-3) * (x * 1E-3)) - (0.5 * qbs * Sqr(x * 0.001));
fd := (Md * 1E6 * Yb) / It;
Mcr := (It / Yb) * (0.5 * Sqrt(fc) + fpe - fd) * 1E-6;
Vci1 := ((1 / 20) * Sqrt(fc) * bw * d + Vd * 1E3 + (((Mcr * 1E6) * (L - (2 * x))) / ((L * x) - Sqr(x)))) * 1E-3;
Vci2 := ((1 / 7) * Sqrt(fc) * bw * d) * 1E-3;
if Vci1 > Vci2 then
  Vci := Vci1
else
  Vci := Vci2;
fpc := Fo / At;
Vcw := (0.3 * (Sqrt(fc) + fpc) * bw * d);
if Vci < Vcw then
  Vc := Vci
else
  Vc := Vcw;
qv := (1.2 * (qbs + qm)) + (1.6 * qh);
Vu := ((0.5 * qv * L) - (qv * x)) * 1E-3;
Vs := (Vu / 0.6) - Vc;
Vsmax := (2 / 3) * Sqrt(fc) * bw * d * 1E-3;
S1 := (2 * 0.25 * Pi * Sqr(Dsengkang) * fy * d) / Vs;
Smax1 := 0.75 * ht;
if S1 < Smax1 then
  S2 := S1
else
  S2 := Smax1;
Smax2 := 600;
if S2 < Smax2 then
  S := S2
else
  S := Smax2;
Avmin1 := (bw * S) / (3 * fy);
Avmin2 := ((Aps * fpu * S) / (80 * fy * d)) * Sqrt(d / bw);
if Avmin1 > Avmin2 then
  Av := Avmin1
else
  Av := Avmin2;
Hsl1 := '1. Momen penyebab retak (Mcr) = ' + Format('%4f', [Mcr]);
Hsl2 := '2. Geser total yang dipikul oleh beton (Vc) = ' + Format('%4f', [Vc]);
Hsl5 := '5. Luasan melintang sengkang minimal (Avmin) = ' + Format('%4f', [Av]);
Hsl6 := '6. Jarak sengkang maksimal (Smax) = ' + Format('%4f', [S]);
Hsl3 := '3. Kekuatan geser batas ultimit (Vu) = ' + Format('%4f', [Vu]);
Hsl4 := '4. Geser total yang dipikul baja (Vs) = ' + Format('%4f', [Vs]);
end;
with Ot_Geser_t2 do begin
  lblht.Caption := '1. ht = ' + FloatToStr(ht);
  lblbw.Caption := '2. bw = ' + FloatToStr(bw);
  lblbof.Caption := '3. bof = ' + FloatToStr(bof);
  lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);
  lblds.Caption := '6. ds = ' + FloatToStr(ds);
  lblfps.Caption := '7. fps = ' + FloatToStr(fps);
  lblaps.Caption := '5. Aps = ' + FloatToStr(Aps);
  lblfc.Caption := '8. fc = ' + FloatToStr(fc);
  lblfy.Caption := '21. fy = ' + FloatToStr(fy);
  lblfpu.Caption := '20. fpu = ' + FloatToStr(fpu);
  lblx.Caption := '12. x = ' + FloatToStr(x);

```

## Listing Program

```

lblL.Caption := ' 9. L = ' + FloatToStr(L);
lblgbeton.Caption := 'beton = ' + FloatToStr(gbeton);
lblqh.Caption := ' 13. qh = ' + FloatToStr(qh);
lblqm.Caption := ' 13. qm = ' + FloatToStr(qm);
lblES.Caption := ' 10. Es = ' + FloatToStr(Es);
lblEc.Caption := ' 11. Ec = ' + FloatToStr(Ec);
lblDfps.Caption := 'fps = ' + FloatToStr(Dfps);
lblDsengkang.Caption := 'sengkang = ' + FloatToStr(Dsengkang);
lbla.Caption := '16. a = ' + FloatToStr(a);
lblb.Caption := '17. b = ' + FloatToStr(b);

lblHasil1.Caption := Hsl1;
lblHasil2.Caption := Hsl2;
lblHasil3.Caption := Hsl3;
lblHasil4.Caption := Hsl4;
lblHasil5.Caption := Hsl5;
lblHasil6.Caption := Hsl6;
ShowModal;
end;
end;

procedure Tgeser_t2.tombolBantuanClick(Sender: TObject);
begin
    frmmenu_bantuan.ShowModal;
end;

procedure Tgeser_t2.tombolKembaliClick(Sender: TObject);
begin
    Close;
end;

procedure Tgeser_t2.Eksekusi(PraAtauPasca: string);
begin
    PraOrPasca := PraAtauPasca;
    if (PraAtauPasca = 'Pra') then
        lblJudul.Caption := 'Tegangan Geser Pada Balok Pra - Tarikan Tampang T Tipe 2'
    else
        lblJudul.Caption := 'Tegangan Geser Pada Balok Pasca -Tarikan Tampang T Tipe 2';
    ShowModal;
end;

procedure Tgeser_t2.tombolSimpanClick(Sender: TObject);
var
    LstSimpan: TStringList;
begin
    LstSimpan := TStringList.Create;
    if PraOrPasca = 'Pra' then begin
        LstSimpan.Add('1');
        LstSimpan.Add('4');
        LstSimpan.Add('5');
        LstSimpan.Add('1');
    end else begin
        LstSimpan.Add('1');
        LstSimpan.Add('4');
        LstSimpan.Add('5');
        LstSimpan.Add('2');
    end;
    end;
    (*— data —*)
    LstSimpan.Add(edtht.Text);
    LstSimpan.Add(edtbw.Text);
    LstSimpan.Add(edtbof.Text);
    LstSimpan.Add(edtdfa.Text);
    LstSimpan.Add(edtds.Text);
    LstSimpan.Add(edtfps.Text);
    LstSimpan.Add(edtAps.Text);
    LstSimpan.Add(edtfc.Text);
    LstSimpan.Add(edtfy.Text);
    LstSimpan.Add(edtfpu.Text);
    LstSimpan.Add(edtx.Text);

```

## Listing Program

```
LstSimpan.Add(edtL.Text);
LstSimpan.Add(edtg beton.Text);
LstSimpan.Add(edtqh.Text);
LstSimpan.Add(edtqm.Text);
LstSimpan.Add(edtEs.Text);
LstSimpan.Add(edtEc.Text);
LstSimpan.Add(edtDfips.Text);
LstSimpan.Add(edtDsengkang.Text);
LstSimpan.Add(edta.Text);
LstSimpan.Add(edtb.Text);
if SaveDialog1.Execute then
    LstSimpan.SaveToFile(SaveDialog1.FileName);
LstSimpan.Free;
end;

end.
```



## Listing Program

```

unit InKehil_pasca_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math, jpeg;
type
  Tkehil_pasca_t2 = class(TForm)
    Label3: TLabel;
    Label6: TLabel;
    Label7: TLabel;
    Label8: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    Label11: TLabel;
    Label13: TLabel;
    Label4: TLabel;
    Label14: TLabel;
    Label15: TLabel;
    Label16: TLabel;
    Label17: TLabel;
    Label2: TLabel;
    Label5: TLabel;
    Label22: TLabel;
    Label18: TLabel;
    Label19: TLabel;
    Label20: TLabel;
    Label21: TLabel;
    Label23: TLabel;
    Label24: TLabel;
    Label25: TLabel;
    Label26: TLabel;
    Label27: TLabel;
    Label28: TLabel;
    Label29: TLabel;
    Label30: TLabel;
    Label12: TLabel;
    Label33: TLabel;
    Label34: TLabel;
    Label40: TLabel;
    Label31: TLabel;
    Panel1: TPanel;
    Image1: TImage;
    edtbw: TEditEx;
    edtht: TEditEx;
    edtdfa: TEditEx;
    edtbfo: TEditEx;
    edta: TEditEx;
    edtb: TEditEx;
    edtAps: TEditEx;
    edtds: TEditEx;
    edtfps: TEditEx;
    edtfc: TEditEx;
    edtfy: TEditEx;
    edtl: TEditEx;
    edtEs: TEditEx;
    edtEc: TEditEx;
    edtH: TEditEx;
    edtgbeon: TEditEx;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolSimpan: TBitBtn;
    tombolAnalisis: TBitBtn;
    SaveDialog1: TSaveDialog;
    procedure tombolAnalisisClick(Sender: TObject);
    procedure tombolBantuanClick(Sender: TObject);
    procedure tombolKembaliClick(Sender: TObject);
    procedure tombolSimpanClick(Sender: TObject);
  private

```

## Listing Program

```

public
end;
var
    kehil_pasca_t2: Tkehil_pasca_t2;
implementation
uses OtKehilangan_pasca_t2, Menu Bantuan;
procedure Tkehil_pasca_t2.tombolAnalisisClick(Sender: TObject);
var
    ht, bw, bof, dfa, ds, fps, Aps, a, b, fc, fy, L, gbeton, H, Es, Ec: Extended;
    At, Q, Ya, Yb, Lo, It, Br8, Br9, Br10, Br11, Br12, br1, br2, br3: Extended;
    Hsl1, Hsl2, Hsl3, Hsl4, Hsl5, Pesan1: string;
begin
    with kehil_pasca_t2 do begin
        ht := edtht.Value;
        bw := edtbw.Value;
        bof := edtbof.Value;
        dfa := edtdfa.Value;
        ds := edtds.Value;
        fps := edtfps.Value;
        Aps := edtAps.Value;
        fc := edtfc.Value;
        fy := edtfy.Value;
        L := edtL.Value;
        gbeton := edtgbeton.Value;
        H := edtH.Value;
        Es := edtEs.Value;
        Ec := edtEc.Value;
        a := edta.Value;
        b := edtb.Value;

        At := (bof - bw) * dfa + a * b + bw * ht + ((Es / Ec) - 1) * Aps;
        Q := ((bof - bw) * dfa * (dfa / 2)) + a * b * (dfa + (b / 3)) + (bw * ht * (ht / 2)) + ((Es / Ec) - 1) * Aps * (ht - ds);
        Ya := Q / At;
        Yb := ht - Ya;
        Lo := Yb - ds;
        It := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht * Sqr(ht / 2)) + ((2 * (a * Power(b, 3)) / 36) + a * b * Sqr(dfa + (b / 3))) + ((Es / Ec) - 1) * Aps * (Sqr(ht - ds))) - At * Sqr(Ya);
        Br8 := 0.5 * (Es / Ec) * (((fps * Aps) / At) + ((fps * Aps * Sqr(Lo)) / It));
        Hsl1 := '1. Kehilangan prategang akibat pemendekan elastis = ' + Format('%4f', [Br8]);
        Br9 := 0.8 * (117.21 - (1.034 * H));
        Hsl2 := '2. Kehilangan prategang akibat susut beton = ' + Format('%4f', [Br9]);
        br1 := (Aps * fps) / At;
        br2 := br1 + ((Aps * fps * Sqr(Lo)) / It);
        br3 := br1 + ((2 / 3) * (br2 - br1));
        Br10 := 1.5 * br3 * (Es / Ec);
        Hsl3 := '3. Kehilangan prategang akibat rangkai beton = ' + Format('%4f', [Br10]);
        Br11 := 137.9 - (0.3 * 0.7 * fy) - (0.4 * Br8) - 0.2 * (Br9 + Br10);
        Hsl4 := '4. Kehilangan prategang akibat relaksasi baja = ' + Format('%4f', [Br11]);
        Br12 := Br8 + Br9 + Br10 + Br11;
        Hsl5 := '5. Kehilangan prategang total = ' + Format('%4f', [Br12]);
        { Jika Br12 <= (0,795 * Sqrt(fci)) maka OK!! }
        if not (Br12 <= (0.2 * fps)) then
            Pesan1 := ' Hasil hitungan >= 0.2xfps -> Tidak sesuai peraturan '
        else
            Pesan1 := ' Hasil hitungan <= 0.2xfps -> Sudah sesuai peraturan '
        end;
    end;
    with Ot_Kehil_Pasca_t2 do begin
        lblht.Caption := '1. ht = ' + FloatToStr(ht);
        lblbs.Caption := '5. ds = ' + FloatToStr(ds);
        lblfps.Caption := '6. fps = ' + FloatToStr(fps);
        lblAps.Caption := '7. Aps = ' + FloatToStr(Aps);
        lblfc.Caption := '8. fc = ' + FloatToStr(fc);
        lblfy.Caption := '9. fy = ' + FloatToStr(fy);
        lblL.Caption := '10. L = ' + FloatToStr(L);
        lblgbeton.Caption := 'beton = ' + FloatToStr(gbeton);
        lblES.Caption := '11. Es = ' + FloatToStr(Es);
        lblEc.Caption := '12. Ec = ' + FloatToStr(Ec);
        lblH.Caption := '13. H = ' + FloatToStr(H);
    end;
end;

```

## Listing Program

```
lbdfa.Caption := ' 4. dfa = ' + FloatToStr(dfa);
lbbw.Caption := ' 2. bw = ' + FloatToStr(bw);
lbbf.Caption := ' 3. bof = ' + FloatToStr(bof);
lba.Caption := ' 15. a = ' + FloatToStr(a);
lbb.Caption := ' 16. b = ' + FloatToStr(b);

lblHasil1.Caption := Hsl1;
lblHasil2.Caption := Hsl2;
lblHasil3.Caption := Hsl3;
lblHasil4.Caption := Hsl4;
lblHasil5.Caption := Hsl5;
lblPesan1.Caption := Pesan1;
ShowModal;
end;
end;

procedure Tkehil_pasca_t2.tombolBantuanClick(Sender: TObject);
begin
    frmmenu_bantuan.ShowModal;
end;

procedure Tkehil_pasca_t2.tombolKembaliClick(Sender: TObject);
begin
    Close;
end;

procedure Tkehil_pasca_t2.tombolSimpanClick(Sender: TObject);
var
    LstSimpan: TStringList;
begin
    LstSimpan := TStringList.Create;
    LstSimpan.Add('1');
    LstSimpan.Add('1');
    LstSimpan.Add('5');
    LstSimpan.Add('2');

    LstSimpan.Add(edtht.Text);
    LstSimpan.Add(edtbw.Text);
    LstSimpan.Add(edtbof.Text);
    LstSimpan.Add(edtdfa.Text);
    LstSimpan.Add(edtds.Text);
    LstSimpan.Add(edtfps.Text);
    LstSimpan.Add(edtAps.Text);
    LstSimpan.Add(edtfc.Text);
    LstSimpan.Add(edtfy.Text);
    LstSimpan.Add(edtL.Text);
    LstSimpan.Add(edtgbeton.Text);
    LstSimpan.Add(edtH.Text);
    LstSimpan.Add(edtEs.Text);
    LstSimpan.Add(edtEc.Text);
    LstSimpan.Add(edta.Text);
    LstSimpan.Add(edtb.Text);
    if SaveDialog1.Execute then
        LstSimpan.SaveToFile(SaveDialog1.FileName);
    LstSimpan.Free;
end;
end.
```

## Listing Program

```

unit InKehil_pra_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math, jpeg;
type
  Tkehil_pra_t2 = class(TForm)
    Label3: TLabel;
    Label6: TLabel;
    Label7: TLabel;
    Label8: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    Label11: TLabel;
    Label13: TLabel;
    Label4: TLabel;
    Label14: TLabel;
    Label15: TLabel;
    Label16: TLabel;
    Label17: TLabel;
    Label2: TLabel;
    Label5: TLabel;
    Label19: TLabel;
    Label28: TLabel;
    Label29: TLabel;
    Label30: TLabel;
    Label36: TLabel;
    Label37: TLabel;
    Label40: TLabel;
    Label23: TLabel;
    Label12: TLabel;
    Label38: TLabel;
    Label39: TLabel;
    Label18: TLabel;
    Label21: TLabel;
    Label22: TLabel;
    Label20: TLabel;
    Label24: TLabel;
    Label25: TLabel;
    Label31: TLabel;
    Panel1: TPanel;
    Image1: TImage;
    edtbw: TEditEx;
    edtht: TEditEx;
    edtdfa: TEditEx;
    edtbof: TEditEx;
    edta: TEditEx;
    edtb: TEditEx;
    edtAps: TEditEx;
    edtds: TEditEx;
    edtfps: TEditEx;
    edtfc: TEditEx;
    edtfy: TEditEx;
    edtL: TEditEx;
    edtEs: TEditEx;
    edtEc: TEditEx;
    edtH: TEditEx;
    edtgbeon: TEditEx;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolSimpan: TBitBtn;
    tombolAnalisis: TBitBtn;
    SaveDialog1: TSaveDialog;
    procedure tombolAnalisisClick(Sender: TObject);
    procedure tombolBantuanClick(Sender: TObject);
    procedure tombolKembaliClick(Sender: TObject);
    procedure tombolSimpanClick(Sender: TObject);
  private

```

## Listing Program

```

public
end;
var
  kehil_pra_t2: Tkehil_pra_t2;
implementation
uses OtKehilangan_pra_t2, Menu_Bantuan;
procedure Tkehil_pra_t2.tombolAnalisisClick(Sender: TObject);
var
  ht, bw, bof, dfa, ds, fps, Aps, a, b, fc, fy, L, gbeton, H, Es, Ec: Extended;
  At, Q, Ya, Yb, Lo, It, Br8, Br9, Br10, Br11, Br12, br1, br2, br3: Extended;
  Hsl1, Hsl2, Hsl3, Hsl4, Hsl5, Pesan1: string;
begin
  with kehil_pra_t2 do begin
    ht := editht.Value;
    bw := editbw.Value;
    bof := editbof.Value;
    dfa := editdfa.Value;
    ds := editds.Value;
    fps := editfps.Value;
    Aps := editAps.Value;
    fc := editfc.Value;
    fy := editfy.Value;
    L := editL.Value;
    gbeton := editgbeton.Value;
    H := editH.Value;
    Es := editEs.Value;
    Ec := editEc.Value;
    a := edita.Value;
    b := editb.Value;

    At := (bof - bw) * dfa + a * b + bw * ht + ((Es / Ec) - 1) * Aps;
    Q := ((bof - bw) * dfa * (dfa / 2)) + a * b * (dfa + (b / 3)) + (bw * ht * (ht / 2)) + ((Es / Ec) - 1) * Aps * (ht - ds);
    Ya := Q / At;
    Yb := ht - Ya;
    Lo := Yb - ds;
    It := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht * Sqr(ht / 2)) + ((2 * (a * Power(b, 3)) / 36) + a * b * Sqr(dfa + (b / 3))) + ((Es / Ec) - 1) * Aps * (Sqr(ht - ds))) - At * Sqr(Ya);
    Br8 := (Es / Ec) * (((fps * Aps) / At) + ((fps * Aps * Sqr(Lo)) / It));
    Hsl1 := '1. Kehilangan prategang akibat pemendekan elastis = ' + Format('%4f', [Br8]);
    Br9 := 117.21 - (1.034 * H);
    Hsl2 := '2. Kehilangan prategang akibat susut beton = ' + Format('%4f', [Br9]);
    br1 := (Aps * fps) / At;
    br2 := br1 + ((Aps * fps * Sqr(Lo)) / It);
    br3 := br1 + ((2 / 3) * (br2 - br1));
    Br10 := 1.5 * br3 * (Es / Ec);
    Hsl3 := '3. Kehilangan prategang akibat rangkai beton = ' + Format('%4f', [Br10]);
    Br11 := 137.9 - (0.4 * Br8) - 0.2 * (Br9 + Br10);
    Hsl4 := '4. Kehilangan prategang akibat relaksasi baja = ' + Format('%4f', [Br11]);
    Br12 := Br8 + Br9 + Br10 + Br11;
    Hsl5 := '5. Kehilangan prategang total = ' + Format('%4f', [Br12]);
    if not (Br12 <= (0.25 * fps)) then
      Pesan1 := 'Hasil hitungan >= 0.25xfps --> Tidak sesuai peraturan '
    else
      Pesan1 := 'Hasil hitungan <= 0.25xfps --> Sudah sesuai peraturan '
    end;
  end;
  with Ot_Kehil_Pra_t2 do begin
    lblht.Caption := '1. ht = ' + FloatToStr(ht);
    lblbs.Caption := '5. ds = ' + FloatToStr(ds);
    lblfps.Caption := '6. fps = ' + FloatToStr(fps);
    lblAps.Caption := '7. Aps = ' + FloatToStr(Aps);
    lblfc.Caption := '8. fc = ' + FloatToStr(fc);
    lblfy.Caption := '9. fy = ' + FloatToStr(fy);
    lblL.Caption := '10. L = ' + FloatToStr(L);
    lblgbeton.Caption := 'beton = ' + FloatToStr(gbeton);
    lblES.Caption := '11. Es = ' + FloatToStr(Es);
    lblEc.Caption := '12. Ec = ' + FloatToStr(Ec);
    lblH.Caption := '13. H = ' + FloatToStr(H);
    lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);
  end;
end;

```



## Listing Program

```
lblbw.Caption := '2. bw = ' + FloatToStr(bw);
lblbof.Caption := '3. bof = ' + FloatToStr(bof);
lbla.Caption := '15. a = ' + FloatToStr(a);
lblb.Caption := '16. b = ' + FloatToStr(b);

lblHasil1.Caption := Hsl1;
lblHasil2.Caption := Hsl2;
lblHasil3.Caption := Hsl3;
lblHasil4.Caption := Hsl4;
lblHasil5.Caption := Hsl5;
lblPesan1.Caption := Pesan1;
ShowModal;
end;
end;

procedure Tkehil_pra_t2.tombolBantuanClick(Sender: TObject);
begin
    frmmenu_bantuan.ShowModal;
end;

procedure Tkehil_pra_t2.tombolKembaliClick(Sender: TObject);
begin
    Close;
end;

procedure Tkehil_pra_t2.tombolSimpanClick(Sender: TObject);
var
    LstSimpan: TStringList;
begin
    LstSimpan := TStringList.Create;
    LstSimpan.Add('1');
    LstSimpan.Add('1');
    LstSimpan.Add('5');
    LstSimpan.Add('1');
    (*-- data --*)
    LstSimpan.Add(edtht.Text);
    LstSimpan.Add(edtbw.Text);
    LstSimpan.Add(edtbof.Text);
    LstSimpan.Add(edtdfa.Text);
    LstSimpan.Add(edtds.Text);
    LstSimpan.Add(edtfps.Text);
    LstSimpan.Add(edtAps.Text);
    LstSimpan.Add(edtfc.Text);
    LstSimpan.Add(edtfy.Text);
    LstSimpan.Add(edtL.Text);
    LstSimpan.Add(edtgbeton.Text);
    LstSimpan.Add(edtH.Text);
    LstSimpan.Add(edtEs.Text);
    LstSimpan.Add(edtEc.Text);
    LstSimpan.Add(edta.Text);
    LstSimpan.Add(edtb.Text);
    if SaveDialog1.Execute then
        LstSimpan.SaveToFile(SaveDialog1.FileName);
    LstSimpan.Free;
end;
end.
```

## Listing Program

```

unit InLintasan_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math, jpeg;
type
  Tlintasan_t2 = class(TForm)
    Label2: TLabel;
    Label3: TLabel;
    Label4: TLabel;
    Label5: TLabel;
    Label6: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    Label11: TLabel;
    Label12: TLabel;
    Label13: TLabel;
    Label14: TLabel;
    Label15: TLabel;
    Label28: TLabel;
    Label29: TLabel;
    Label30: TLabel;
    Label31: TLabel;
    Label32: TLabel;
    Label33: TLabel;
    Label34: TLabel;
    Label35: TLabel;
    Label37: TLabel;
    Label38: TLabel;
    Label41: TLabel;
    Label42: TLabel;
    Label43: TLabel;
    Label44: TLabel;
    Label45: TLabel;
    Label46: TLabel;
    Label48: TLabel;
    Label51: TLabel;
    Label52: TLabel;
    Label54: TLabel;
    Label7: TLabel;
    Label8: TLabel;
    Label39: TLabel;
    Label40: TLabel;
    Label1: TLabel;
    Panel1: TPanel;
    Image1: TImage;
    edtht: TEditEx;
    edtbof: TEditEx;
    edtdfa: TEditEx;
    edtds: TEditEx;
    edtAps: TEditEx;
    edtfps: TEditEx;
    edta: TEditEx;
    edtb: TEditEx;
    edtEs: TEditEx;
    edtEc: TEditEx;
    edtL: TEditEx;
    edtqh: TEditEx;
    edtDlubang: TEditEx;
    edtgbeton: TEditEx;
    edtDfps: TEditEx;
    Panel2: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolSimpan: TBitBtn;
    tombolAnalisis: TBitBtn;
    SaveDialog1: TSaveDialog;
    Label16: TLabel;
    Label17: TLabel;
  end;

```

## Listing Program

```

edtfc: TEditEx;
edtbw: TEditEx;
lblJudul: TLabel;
procedure tombolAnalisisClick(Sender: TObject);
procedure tombolBantuanClick(Sender: TObject);
procedure tombolKembaliClick(Sender: TObject);
procedure tombolSimpanClick(Sender: TObject);
private
  PraOrPasca: string;
public
  procedure Eksekusi(PraAtauPasca: string);
end;
var
  lintasan_t2: Tlintasan_t2;
implementation
  uses OtLintasan_t2, Menu_Bantuan;
  procedure Tlintasan_t2.tombolAnalisisClick(Sender: TObject);
  var
    ht, bw, bof, dfa, ds, fps, Aps, a, b, fc, L, gbeton, qh, Es, Ec, Dfps, Dlubang: Extended;
    At, Q, Ya, Yb, Lo, It, Ka, Kb, Fo, qMin, qMax, MMin1, MMin2, MMin3, MMin4, MMin5, MMax1, MMax2,
    MMax3, MMax4, MMax5, F, Br25, Br26, Br27, Br28, Br29, Br30, Br31, Br32, Br33, Br34, Br35, Br36, Br37, Br38, coa1,
    eoa2, eoa3, eoa4, eoa5, eob1, eob2, eob3, eob4, eob5: Extended;
  begin
    with lintasan_t2 do begin
      ht := edtht.Value;
      bof := edtbof.Value;
      bw := edtbw.Value;
      dfa := edtdfa.Value;
      ds := edtds.Value;
      a := edta.Value;
      b := edtb.Value;
      Dlubang := edtDlubang.Value;
      L := edtL.Value;
      gbeton := edtgbeton.Value;
      qh := edtqh.Value;
      Es := edtEs.Value;
      Ec := edtEc.Value;
      Dfps := edtDfps.Value;
      fc := edtfc.Value;
      Aps := edtAps.Value;
      fps := edtfps.Value;

      At := (bof - bw) * dfa + bw * ht + a * b + ((Es / Ec) - 1) * Aps;
      Q := ((bof - bw) * dfa * (dfa / 2)) + (bw * ht * (ht / 2)) + (a * b * (dfa + (b / 3))) + (Es / Ec - 1) * Aps * (ht - ds);
      Ya := Q / At;
      Yb := ht - Ya;
      Lo := Yb - ds;
      It := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht *
      Sqr(ht / 2)) + (2 * ((a * Power(b, 3)) / 36)) + (a * b * Sqr(dfa + (b / 3))) + ((Es / Ec - 1) * Aps * Sqr(ht - ds))) - At *
      Sqr(Ya);
      Ka := (It / At) / Yb;
      Kb := (It / At) / Ya;
      Fo := fps * Aps * 1E-3;
      F := (fps - Dfps) * Aps * 1E-3;
      qMin := At * gbeton * 1E-6;
      qMax := qMin + (qh * 1E-6);
      MMin1 := qMin * (((0.1 * L) * (0.9 * L)) / L) * 0.5 * L * 1E-3;
      MMin2 := qMin * (((0.2 * L) * (0.8 * L)) / L) * 0.5 * L * 1E-3;
      MMin3 := qMin * (((0.3 * L) * (0.7 * L)) / L) * 0.5 * L * 1E-3;
      MMin4 := qMin * (((0.4 * L) * (0.6 * L)) / L) * 0.5 * L * 1E-3;
      MMin5 := qMin * (((0.5 * L) * (0.5 * L)) / L) * 0.5 * L * 1E-3;
      MMax1 := qMax * (((0.1 * L) * (0.9 * L)) / L) * 0.5 * L * 1E-3;
      MMax2 := qMax * (((0.2 * L) * (0.8 * L)) / L) * 0.5 * L * 1E-3;
      MMax3 := qMax * (((0.3 * L) * (0.7 * L)) / L) * 0.5 * L * 1E-3;
      MMax4 := qMax * (((0.4 * L) * (0.6 * L)) / L) * 0.5 * L * 1E-3;
      MMax5 := qMax * (((0.5 * L) * (0.5 * L)) / L) * 0.5 * L * 1E-3;

      Br25 := (MMin1 / Fo);
      Br26 := (MMin2 / Fo);
    end;
  end;

```

## Listing Program

```

Br27 := (MMin3 / Fo);
Br28 := (MMin4 / Fo);
Br29 := (MMin5 / Fo);
Br30 := (MMax1 / F);
Br31 := (MMax2 / F);
Br32 := (MMax3 / F);
Br33 := (MMax4 / F);
Br34 := (MMax5 / F);
Br35 := 0.25 * Sqrt(0.75 * fc);
Br36 := 0.5 * Sqrt(fc);
Br37 := (Br36 * Ka * At) / (F * 1E3);
Br38 := (Br35 * Kb * At) / (Fo * 1E3);
eoa1 := Br25;
eoa2 := Br26;
eoa3 := Br27;
eoa4 := Br28;
eoa5 := Br29;
eob1 := Br30;
eob2 := Br31;
eob3 := Br32;
eob4 := Br33;
eob5 := Br34;
end;
with Ot_Lintasan_t2 do begin
  lblht.Caption := '1. ht = ' + FloatToStr(ht);
  lblbw.Caption := '2. bw = ' + FloatToStr(bw);
  lblbof.Caption := '3. bof = ' + FloatToStr(bof);
  lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);
  lblfs.Caption := '5. ds = ' + FloatToStr(ds);
  lblfps.Caption := '6. fps = ' + FloatToStr(fps);
  lblAps.Caption := '7. Aps = ' + FloatToStr(Aps);
  lbla.Caption := '15. a = ' + FloatToStr(a);
  lblb.Caption := '16. b = ' + FloatToStr(b);
  lblL.Caption := '10. L = ' + FloatToStr(L);
  lblgbeton.Caption := 'beton = ' + FloatToStr(gbeton);
  lblqh.Caption := '8. qh = ' + FloatToStr(qh);
  lblES.Caption := '11. Es = ' + FloatToStr(Es);
  lblEc.Caption := '12. Ec = ' + FloatToStr(Ec);
  lblDfps.Caption := 'fps = ' + FloatToStr(Dfps);
  lblfc.Caption := '17. fc = ' + FloatToStr(fc);
  lblDlubang.Caption := 'lubang = ' + FloatToStr(Dlubang);

  lblboa1.Caption := '1. eoa1 = ' + Format('%4f', [eoa1]);
  lblboa2.Caption := '2. eoa2 = ' + Format('%4f', [eoa2]);
  lblboa3.Caption := '3. eoa3 = ' + Format('%4f', [eoa3]);
  lblboa4.Caption := '4. eoa4 = ' + Format('%4f', [eoa4]);
  lblboa5.Caption := '5. eoa5 = ' + Format('%4f', [eoa5]);
  lblbo1.Caption := '6. eob1 = ' + Format('%4f', [eob1]);
  lblbo2.Caption := '7. eob2 = ' + Format('%4f', [eob2]);
  lblbo3.Caption := '8. eob3 = ' + Format('%4f', [eob3]);
  lblbo4.Caption := '9. eob4 = ' + Format('%4f', [eob4]);
  lblbo5.Caption := '10. eob5 = ' + Format('%4f', [eob5]);
  lblKa.Caption := '11. Ka = ' + Format('%4f', [Ka]);
  lblKb.Caption := '12. Kb = ' + Format('%4f', [Kb]);

  ShowModal;
end;

end;

procedure Tlintasan_t2.tombolBantuanClick(Sender: TObject);
begin
  frmmenu_bantuan.ShowModal;
end;

procedure Tlintasan_t2.tombolKembaliClick(Sender: TObject);
begin

```

## Listing Program

```

Close;
end;

procedure TIntasan_t2.Eksekusi(PraAtauPasca: string);
begin
  PraOrPasca := PraAtauPasca;
  if (PraAtauPasca = 'Pra') then
    lblJudul.Caption := 'Lintasan Aman Tendon Pra - Tarikan Tampang T Tipe 2'
  else
    lblJudul.Caption := 'Lintasan Aman Tendon Pasca - Tarikan Tampang T Tipe 2';
  ShowModal;
end;

procedure TIntasan_t2.tombolSimpanClick(Sender: TObject);
var
  LstSimpan: TStringList;
begin
  LstSimpan := TStringList.Create;
  if PraOrPasca = 'Pra' then begin
    LstSimpan.Add('1');
    LstSimpan.Add('6');
    LstSimpan.Add('5');
    LstSimpan.Add('1');
  end else begin
    LstSimpan.Add('1');
    LstSimpan.Add('6');
    LstSimpan.Add('5');
    LstSimpan.Add('2');
  end;
  (*— data —*)
  LstSimpan.Add(edtht.Text);
  LstSimpan.Add(edtbof.Text);
  LstSimpan.Add(edtbw.Text);
  LstSimpan.Add(edtdfa.Text);
  LstSimpan.Add(edtds.Text);
  LstSimpan.Add(edta.Text);
  LstSimpan.Add(edtdlubang.Text);
  LstSimpan.Add(edtL.Text);
  LstSimpan.Add(edtgbeton.Text);
  LstSimpan.Add(edtqh.Text);
  LstSimpan.Add(edtEs.Text);
  LstSimpan.Add(edtEc.Text);
  LstSimpan.Add(edtDfps.Text);
  LstSimpan.Add(edtfc.Text);
  LstSimpan.Add(edtAps.Text);
  LstSimpan.Add(edtfps.Text);
  if SaveDialog1.Execute then
    LstSimpan.SaveToFile(SaveDialog1.FileName);
  LstSimpan.Free;
end;
end.

```

## Listing Program

```

unit InMomen_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, jpeg;
type
  Tmomen_t2 = class(TForm)
    Label3: TLabel;
    Label6: TLabel;
    Label7: TLabel;
    Label8: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    Label11: TLabel;
    Label13: TLabel;
    Label4: TLabel;
    Label18: TLabel;
    Label20: TLabel;
    Label32: TLabel;
    Label33: TLabel;
    Label26: TLabel;
    Label27: TLabel;
    Label30: TLabel;
    Label34: TLabel;
    Label35: TLabel;
    Label36: TLabel;
    Label37: TLabel;
    Label41: TLabel;
    Label42: TLabel;
    Label43: TLabel;
    Label44: TLabel;
    Label45: TLabel;
    Label12: TLabel;
    Label14: TLabel;
    Label15: TLabel;
    Label16: TLabel;
    Label17: TLabel;
    Label19: TLabel;
    Label21: TLabel;
    Label1: TLabel;
    Panel1: TPanel;
    Image1: TImage;
    edtth: TEditEx;
    edtbof: TEditEx;
    edtdfa: TEditEx;
    edtbw: TEditEx;
    edtAps: TEditEx;
    edtAs1: TEditEx;
    edtAss: TEditEx;
    edtdps: TEditEx;
    edtds1: TEditEx;
    edtds: TEditEx;
    edtfps: TEditEx;
    edtfc: TEditEx;
    edtfy: TEditEx;
    edtfpu: TEditEx;
    edtDfps: TEditEx;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolSimpan: TBitBtn;
    tombolAnalisis: TBitBtn;
    SaveDialog1: TSaveDialog;
    lblJudul: TLabel;
    procedure tombolKembaliClick(Sender: TObject);
    procedure tombolBantuanClick(Sender: TObject);
    procedure tombolAnalisisClick(Sender: TObject);
    procedure tombolSimpanClick(Sender: TObject);
  private

```



## Listing Program

```

PraOrPasca: string;
public
  procedure Eksekusi(PraAtauPasca: string);
end;
var
  momen_t2: Tmomen_t2;
implementation
  uses OtMomen_t2, Menu_Bantuan;

  procedure Tmomen_t2.tombolKembaliClick(Sender: TObject);
  begin
    Close;
  end;

  procedure Tmomen_t2.tombolBantuanClick(Sender: TObject);
  begin
    frmmenu_bantuan.ShowModal;
  end;

  procedure Tmomen_t2.tombolAnalisisClick(Sender: TObject);
  var
    ht, bof, dfa, bw, ds, ds1, dps, fps, Aps, Ass, As1, fc, fy, fpu, Dfps: Extended;
    rp, fp, wp, w, w1, wtot, T, a1, a2, Mn, Mn2, Mu, Mu2, Tp, Ts, Ttotal, g, z, Br11, Br12, Br13, Apf, Apw, rpw, wpw,
    Mbadan, Msayap, Mn3, Mu3: Extended;
    Hsl1, Hsl2, Hsl3, Hsl4, Pesan1, Pesan2: string;
  begin
    with momen_t2 do begin
      ht := edtht.Value;
      ds := edtds.Value;
      fps := edtfps.Value;
      Aps := edtAps.Value;
      fc := edtfc.Value;
      Ass := edtAss.Value;
      As1 := edtAs1.Value;
      fy := edtfy.Value;
      fpu := edtfpu.Value;
      ds1 := edtds1.Value;
      dps := edtdps.Value;
      Dfps := edtDfps.Value;
      bw := edtbw.Value;
      dfa := edtdfa.Value;
      bof := edtbof.Value;

      rp := Aps / (bof * dps);
      fp := fpu * (1 - (0.5 * rp * (fpu / fc)));
      wp := (rp * fp) / fc;
      w := (Ass * fy) / (bof * ds * fc);
      w1 := (As1 * fy) / (bof * ds1 * fc);
      wtot := wp + w - w1;
      if wtot > 0.3 then
        Pesan1 := '[ Rasio penulangan tidak sesuai peraturan ( perkecil luasan tulangan non prategang ) ]'
      else
        Pesan1 := '[ Rasio penulangan sudah sesuai peraturan ]';
      T := Aps * fp;
      a1 := (T) / (0.85 * fc * bof);
      if a1 < dfa then
        begin
          Pesan2 := '[ Balok dianalisis sebagai balok tampang persegi ]';
          Mn := (T * (dps - (0.5 * a1))) * 1E-6;
          Mu := 0.9 * Mn;
          Hsl1 := '1. Momen nominal (Mn) = ' + Format('%4f', [Mn]);
          Hsl2 := '2. Momen ultimit (Mu) = ' + Format('%4f', [Mu]);

          Br11 := (fps - Dfps) + 69 + ((1.4 * fc) / (100 * rp));
          Br12 := 0.5 * (bw * (0.5 * ht));
          Br13 := 0.004 * Br12;
          Tp := Br11 * Aps;
          Ts := fy * Br13;
          Ttotal := Tp + Ts;

```

## Listing Program

```

g := ((Tp * (ht - dps)) + (Ts * 50)) / Ttotal;
a2 := (Ttotal) / (0.85 * fc * bof);
z := ht - (0.5 * a2) - g;
Mn2 := (Ttotal * z) * 1E-6;
Mu2 := 0.9 * Mn2;
Hsl3 := '1. Momen nominal (Mn) = ' + Format('%4f', [Mn2]);
Hsl4 := '2. Momen ultimit (Mu) = ' + Format('%4f', [Mu2]);
end
else
  Pesan2 := 'Balok dianalisis sebagai balok tampang T';
begin
  Apf := (0.85 * fc * (bof - bw) * dfa) / fp;
  Apw := Aps - Apf;
  rpw := Apw / (bw * dps);
  wpw := (rpw * fp) / fc;
  Mbadan := Apw * fp * (dps - (0.5 * a1));
  Msayap := 0.85 * fc * (bof - bw) * dfa * (dps - (0.5 * dfa));
  Mn3 := (Mbadan + Msayap) * 1E-6;
  Mu3 := 0.9 * Mn3;
  Hsl1 := '1. Momen nominal (Mn) = ' + Format('%4f', [Mn3]);
  Hsl2 := '2. Momen ultimit (Mu) = ' + Format('%4f', [Mu3]);

  Br11 := (fps - Dfps) + 69 + ((1.4 * fc) / (100 * rp));
  Br12 := 0.5 * (bw * (0.5 * ht));
  Br13 := 0.004 * Br12;
  Tp := Br11 * Aps;
  Ts := fy * Br13;
  Ttotal := Tp + Ts;
  g := ((Tp * (ht - dps)) + (Ts * 50)) / Ttotal;
  a2 := (Ttotal) / (0.85 * fc * bof);
  z := ht - (0.5 * a2) - g;
  Mn2 := (Ttotal * z) * 1E-6;
  Mu2 := 0.9 * Mn2;
  Hsl3 := '1. Momen nominal (Mn) = ' + Format('%4f', [Mn2]);
  Hsl4 := '2. Momen ultimit (Mu) = ' + Format('%4f', [Mu2]);
end;
end;
with Ot_Momen_t2 do begin
  lblht.Caption := '1. ht = ' + FloatToStr(ht);
  lblds.Caption := '10. ds = ' + FloatToStr(ds);
  lblfps.Caption := '11. fps = ' + FloatToStr(fps);
  lblaps.Caption := '5. Aps = ' + FloatToStr(Aps);
  lblfc.Caption := '12. fc = ' + FloatToStr(fc);
  lblfy.Caption := '13. fy = ' + FloatToStr(fy);
  lblfpu.Caption := '14. fpu = ' + FloatToStr(fpu);
  lbls1.Caption := '9. ds1 = ' + FloatToStr(ds1);
  lbls2.Caption := '8. dps = ' + FloatToStr(dps);
  lblass.Caption := '6. As = ' + FloatToStr(As);
  lblasl.Caption := '7. As1 = ' + FloatToStr(As1);
  lbldfps.Caption := 'fps = ' + FloatToStr(Dfps);
  lblbw.Caption := '2. bw = ' + FloatToStr(bw);
  lblbof.Caption := '3. bof = ' + FloatToStr(bof);
  lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);

  lblHasil1.Caption := Hsl1;
  lblHasil2.Caption := Hsl2;
  lblHasil3.Caption := Hsl3;
  lblHasil4.Caption := Hsl4;
  lblPesan1.Caption := Pesan1;
  lblPesan2.Caption := Pesan2;
  ShowModal;
end;
end;

procedure Tmomen_t2.Eksekusi(PraAtauPasca: string);
begin
  PraOrPasca := PraAtauPasca;
  if (PraAtauPasca = 'Pra') then
    lblJudul.Caption := 'Momen Ultimit Pada Balok Pra - Tarikan Tampang T Tipe 2'
  end;
end;

```



## Listing Program

```
else
    lblJudul.Caption := '    Momen Ultimit Pada Balok Pasca - Tarikan Tampang T Tipe 2';
ShowModal;
end;

procedure Tmomen_t2.tombolSimpanClick(Sender: TObject);
var
    LstSimpan: TStringList;
begin
    LstSimpan := TStringList.Create;
    if PraOrPasca = 'Pra' then begin
        LstSimpan.Add('1');
        LstSimpan.Add('3');
        LstSimpan.Add('5');
        LstSimpan.Add('1');
    end else begin
        LstSimpan.Add('1');
        LstSimpan.Add('3');
        LstSimpan.Add('5');
        LstSimpan.Add('2');
    end;

    LstSimpan.Add(edtht.Text);
    LstSimpan.Add(edtds.Text);
    LstSimpan.Add(edtips.Text);
    LstSimpan.Add(edtAps.Text);
    LstSimpan.Add(edtfc.Text);
    LstSimpan.Add(edtAss.Text);
    LstSimpan.Add(edtAsl.Text);
    LstSimpan.Add(edtfy.Text);
    LstSimpan.Add(edtipu.Text);
    LstSimpan.Add(edtdsl.Text);
    LstSimpan.Add(edtdps.Text);
    LstSimpan.Add(edtDfps.Text);
    LstSimpan.Add(edtbw.Text);
    LstSimpan.Add(edtdfa.Text);
    LstSimpan.Add(edtbof.Text);
    if SaveDialog1.Execute then
        LstSimpan.SaveToFile(SaveDialog1.FileName);
    LstSimpan.Free;
end;

end.
```

## Listing Program

```

unit Input_Data_T_2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math, jpeg;
type
  TInput_Data_T2 = class(TForm)
    Label13: TLabel;
    Label6: TLabel;
    Label17: TLabel;
    Label8: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    Label11: TLabel;
    Label13: TLabel;
    Label4: TLabel;
    Label14: TLabel;
    Label15: TLabel;
    Label16: TLabel;
    Label2: TLabel;
    Label5: TLabel;
    Label19: TLabel;
    Label28: TLabel;
    Label29: TLabel;
    Label30: TLabel;
    Label36: TLabel;
    Label37: TLabel;
    Label40: TLabel;
    Label23: TLabel;
    Label12: TLabel;
    Label38: TLabel;
    Label39: TLabel;
    Label18: TLabel;
    Label21: TLabel;
    Label22: TLabel;
    Label20: TLabel;
    Label24: TLabel;
    Label25: TLabel;
    Label31: TLabel;
    Panel1: TPanel;
    Image1: TImage;
    editbw: TEditEx;
    edtht: TEditEx;
    edtdfa: TEditEx;
    editbof: TEditEx;
    edta: TEditEx;
    editb: TEditEx;
    edtAps: TEditEx;
    editds: TEditEx;
    editfps: TEditEx;
    editfc: TEditEx;
    editfy: TEditEx;
    editL: TEditEx;
    editEs: TEditEx;
    editEc: TEditEx;
    editgbeton: TEditEx;
    SaveDialog1: TSaveDialog;
    Panel2: TPanel;
    BitBtn1: TBitBtn;
    BitBtn2: TBitBtn;
    BitBtn3: TBitBtn;
    BitBtn4: TBitBtn;
    procedure tombolBantuanClick(Sender: TObject);
    procedure tombolKembaliClick(Sender: TObject);
    procedure BitBtn4Click(Sender: TObject);
    procedure BitBtn3Click(Sender: TObject);
  private
    Pilihan2, Pilihan4: Integer;
  public

```

## Listing Program

```

    procedure Eksekusi(Pil2, Pil4: Integer);
    end;
var
    Input_Data_T2: TInput_Data_T2;
implementation
uses Menu_Bantuan, InAnalisis, Menu_Penegangan, P2_InKehil_pra_t2,
    P2_InKehil_pasca_t2, P2_InTegang_pra_t2, P2_InMomen_t2, P2_InGeser_t2,
    P2_InAngkur_t2, P2_InLintasan_t2, P2_InTegang_pasca_t2_2;

procedure TInput_Data_T2.tombolBantuanClick(Sender: TObject);
begin
    frmmenu_bantuan.ShowModal;
end;

procedure TInput_Data_T2.tombolKembaliClick(Sender: TObject);
begin
    Close;
end;

procedure TInput_Data_T2.BitBtn4Click(Sender: TObject);
begin
    case Pilihan2 of
        1: if (Pilihan4 = 1) then p2kehil_pra_t2.ShowModal
            else p2kehil_pasca_t2.ShowModal;
        2: if (Pilihan4 = 1) then p2tegang_pra_t2.ShowModal
            else p2tegang_pasca_t2_2.ShowModal;
        3: p2momen_t2.ShowModal;
        4: p2geser_t2.ShowModal;
        5: p2angkur_t2.ShowModal;
        6: p2lintasan_t2.ShowModal;
    end;
end;

procedure TInput_Data_T2.Eksekusi(Pil2, Pil4: Integer);
begin
    Pilihan2 := Pil2;
    Pilihan4 := Pil4;
    ShowModal;
end;

procedure TInput_Data_T2.BitBtn3Click(Sender: TObject);
var
    LstSimpan: TStringList;
begin
    LstSimpan := TStringList.Create;
    LstSimpan.Add('2');
    LstSimpan.Add(IntToStr(Pilihan2));
    LstSimpan.Add('5');
    LstSimpan.Add(IntToStr(Pilihan4));
    LstSimpan.Add(edtht.Text);
    LstSimpan.Add(edtbw.Text);
    LstSimpan.Add(edtdfa.Text);
    LstSimpan.Add(edtbof.Text);
    LstSimpan.Add(edta.Text);
    LstSimpan.Add(edtb.Text);
    LstSimpan.Add(edtAps.Text);
    LstSimpan.Add(edtds.Text);
    LstSimpan.Add(edtfps.Text);
    LstSimpan.Add(edtfc.Text);
    LstSimpan.Add(edtfy.Text);
    LstSimpan.Add(edtL.Text);
    LstSimpan.Add(edtEs.Text);
    LstSimpan.Add(edtEc.Text);
    LstSimpan.Add(edtgbeton.Text);
    if SaveDialog1.Execute then
        LstSimpan.SaveToFile(SaveDialog1.FileName);
    LstSimpan.Free;
end;
end.

```

## Listing Program

```

unit InTegang_pasca_t2_2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math, jpeg;
type
  Ttegang_pasca_t2_2 = class(TForm)
    Label13: TLabel;
    Label6: TLabel;
    Label7: TLabel;
    Label8: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    Label11: TLabel;
    Label13: TLabel;
    Label4: TLabel;
    Label14: TLabel;
    Label15: TLabel;
    Label16: TLabel;
    Label2: TLabel;
    Label5: TLabel;
    Label18: TLabel;
    Label20: TLabel;
    Label21: TLabel;
    Label28: TLabel;
    Label29: TLabel;
    Label32: TLabel;
    Label33: TLabel;
    Label12: TLabel;
    Label17: TLabel;
    Label19: TLabel;
    Label30: TLabel;
    Label36: TLabel;
    Label37: TLabel;
    Label40: TLabel;
    Label23: TLabel;
    Label34: TLabel;
    Label38: TLabel;
    Label39: TLabel;
    Label43: TLabel;
    Label35: TLabel;
    Label41: TLabel;
    Label42: TLabel;
    Label44: TLabel;
    Label48: TLabel;
    Label49: TLabel;
    Label22: TLabel;
    Label24: TLabel;
    Label31: TLabel;
    Panel1: TPanel;
    Image1: TImage;
    edtbtw: TEditEx;
    edtht: TEditEx;
    edtdfa: TEditEx;
    edtbfo: TEditEx;
    edta: TEditEx;
    edtb: TEditEx;
    edtAps: TEditEx;
    edtds: TEditEx;
    edtfps: TEditEx;
    edtfc: TEditEx;
    edtfci: TEditEx;
    edtL: TEditEx;
    edtDlubang: TEditEx;
    edtDfips: TEditEx;
    edtgbeon: TEditEx;
    edtEc: TEditEx;
    edtEs: TEditEx;
    edtqh: TEditEx;
  end;

```

## Listing Program

```

Panel3: TPanel;
tombolKembali: TBitBtn;
tombolBantuan: TBitBtn;
tombolSimpan: TBitBtn;
tombolAnalisis: TBitBtn;
SaveDialog1: TSaveDialog;
procedure tombolAnalisisClick(Sender: TObject);
procedure tombolBantuanClick(Sender: TObject);
procedure tombolKembaliClick(Sender: TObject);
procedure tombolSimpanClick(Sender: TObject);
private
public
end;
var
  tegang_pasca_t2_2: Ttegang_pasca_t2_2;
implementation
uses OtTegang_pascat2, Menu_Bantuan;

procedure Ttegang_pasca_t2_2.tombolAnalisisClick(Sender: TObject);
var
  ht, bw, bof, dfa, ds, fps, Aps, a, b, fc, fci, L, gbeton, qh, Es, Ec, Dfps, Dlubang: Extended;
  At, Q, Ya, Yb, Lo, It, Fo, Br8, Br9, Br10, qbs, Mbs, Br13, Br14, Br15, Br16, Br19, F, Br21, Br22, Br23, Mbh, Br25, Br26,
  Br27, Br28, Br31, At2, Q2, Ya2, Yb2, Lo2, It2, Br38, Br39, Br40, Br41, Br44: Extended;
  Hsl1, Hsl2, Hsl3, Hsl4, Hsl5, Hsl6, Hsl7, Hsl8, Hsl9, Pesan1, Pesan2, Pesan3, Pesan4, Pesan5, Pesan6: string;
begin
  with tegang_pasca_t2_2 do begin
    ht := edtht.Value;
    bw := edtbw.Value;
    bof := editbof.Value;
    dfa := editdfa.Value;
    ds := editds.Value;
    fps := editfps.Value;
    Aps := edtAps.Value;
    a := edta.Value;
    b := edtb.Value;
    fc := editfc.Value;
    fci := editfci.Value;
    L := editL.Value;
    gbeton := editgbeton.Value;
    qh := editqh.Value;
    Es := editEs.Value;
    Ec := editEc.Value;
    Dfps := editDfps.Value;
    Dlubang := editDlubang.Value;

    At := ((bof - bw) * dfa + bw * ht + a * b) - (1 / 4) * Pi * (Sqr(Dlubang));
    Q := ((bof - bw) * dfa * (dfa / 2)) + (bw * ht * (ht / 2)) + (a * b * (dfa + (b / 3))) - ((1 / 4) * Pi * (Sqr(Dlubang)) * (ht - ds));
    Ya := Q / At;
    Yb := ht - Ya;
    Lo := Yb - ds;
    It := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht * Sqr(ht / 2)) + (2 * ((a * Power(b, 3)) / 36) + a * b * (Sqr(dfa + (b / 3))))) - (((1 / 4) * Pi) * (Power(Dlubang / 2, 4)) + (((1 / 4) * Pi * Sqr(Dlubang)) * (ht - ds))) - At * Sqr(Ya);
    Fo := fps * Aps;
    Br8 := -1 * (Fo / At);
    Br9 := (Fo * Lo * Ya) / It;
    Br10 := -1 * ((Fo * Lo * Yb) / It);
    qbs := At * gbeton * 1E-6;
    Mbs := (1 / 8) * qbs * Sqr(L);
    Br13 := -1 * ((Mbs * Ya) / It);
    Br14 := (Mbs * Yb) / It;
    Br15 := Br8 + Br9 + Br13;
    Hsl1 := '1. Tegangan awal beton tepi atas = ' + Format('%4f', [Br15]);
    Br16 := Br8 + Br10 + Br14;
    Hsl2 := '2. Tegangan awal beton tepi bawah = ' + Format('%4f', [Br16]);
    if (Br15 <= (0.25 * Sqr(fci))) then
      Pesan1 := 'Hasil hitungan <= 0.25 Sqr(fci) :: Sudah sesuai peraturan '
    else

```

## Listing Program

```

Pesan1 := 'Hasil hitungan >= 0.25 Sqrt(f'ci) :: Tidak sesuai peraturan';
if (Br16 <= (Abs(-0.6 * fci))) then
  Pesan2 := 'Hasil hitungan <= Abs(-0.6 * f'ci) :: Sudah sesuai peraturan'
else
  Pesan2 := 'Hasil hitungan >= Abs(-0.6 * f'ci) :: Tidak sesuai peraturan';
Br19 := fps + (Es / Ec) * (Br8 + (Lo / Yb) * Br10 + (Lo / Yb) * Br14);
Hsl3 := '3. Tegangan pada baja tendon sebelum transfer = ' + Format('%4f', [Br19]);
F := (fps - Dfps) * Aps;
Br21 := -1 * (F / At);
Br22 := (F * I.o * Ya) / It;
Br23 := -1 * ((F * Lo * Yb) / It);
Mbh := (1 / 8) * qh * Sqr(L);
Br25 := (-1 * (Mbh * Ya)) / It;
Br26 := (Mbh * Yb) / It;
Br27 := Br21 + Br22 + Br13 + Br25;
Hsl4 := '4. Tegangan akhir beton tepi atas tanpa grouting = ' + Format('%4f', [Br27]);
Br28 := Br21 + Br23 + Br14 + Br26;
Hsl5 := '5. Tegangan akhir beton tepi bawah tanpa grouting = ' + Format('%4f', [Br28]);
if (Br27 < (Abs(-0.45 * Sqrt(f'c)))) then
  Pesan3 := 'Hasil hitungan < Abs(-0.45 * Sqrt(f'c)) :: Sudah sesuai peraturan'
else
  Pesan3 := 'Hasil hitungan > Abs(-0.45 * Sqrt(f'c)) :: Tidak sesuai peraturan';
if (Br28 < (0.5 * Sqrt(f'c))) then
  Pesan4 := 'Hasil hitungan < 0.5 * Sqrt(f'c) :: Sudah sesuai peraturan'
else
  Pesan4 := 'Hasil hitungan < 0.5 * Sqrt(f'c) :: Tidak sesuai peraturan';
Br31 := (fps - dfps) + (Es / Ec) * (Br21 + (Lo / Yb) * Br23 + (Lo / Yb) * Br14 + (Lo / Yb) * Br26);
Hsl6 := '6. Tegangan pada baja tendon setelah transfer tanpa grouting = ' + Format('%4f', [Br31]);
At2 := (bof - bw) * dfa + bw * ht + a * b + ((Es / Ec) - 1) * Aps;
Q2 := ((bof - bw) * dfa * (dfa / 2)) + (a * b * (dfa + (b / 3))) + (((Es / Ec) - 1) * Aps * (ht - ds));
Ya2 := Q2 / At2;
Yb2 := ht - Ya2;
Lo2 := Yb2 - ds;
It2 := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht * Sqr(ht / 2)) + (2 * ((a * Power(b, 3)) / 36) + a * b * (Sqr(dfa + (b / 3)))) + (((Es / Ec) - 1) * Aps * (Sqr(ht - ds)))) - (At2 * Sqr(Ya2));
Br38 := (-1 * (Mbh * Ya2)) / It2;
Br39 := (Mbh * Yb2) / It2;
Br40 := Br21 + Br22 + Br13 + Br38;
Hsl7 := '7. Tegangan akhir beton tepi atas dengan grouting = ' + Format('%4f', [Br40]);
Br41 := Br21 + Br23 + Br14 + Br39;
Hsl8 := '8. Tegangan akhir beton tepi bawah dengan grouting = ' + Format('%4f', [Br41]);
if (Br40 < (Abs(-0.45 * Sqrt(f'c)))) then
  Pesan5 := 'Hasil hitungan < Abs(-0.45 * Sqrt(f'c)) :: Sudah sesuai peraturan'
else
  Pesan5 := 'Hasil hitungan > Abs(-0.45 * Sqrt(f'c)) :: Tidak sesuai peraturan';
if (Br41 < (0.5 * Sqrt(f'c))) then
  Pesan6 := 'Hasil hitungan < 0.5 * Sqrt(f'c) :: Sudah sesuai peraturan'
else
  Pesan6 := 'Hasil hitungan > 0.5 * Sqrt(f'c) :: Tidak sesuai peraturan';
Br44 := (fps - Dfps) + (Es / Ec) * (Br21 + (Lo / Yb) * Br23 + (Lo / Yb) * Br14 + (Lo2 / Yb2) * Br39);
Hsl9 := '9. Tegangan pada baja setelah transfer dengan grouting = ' + Format('%4f', [Br44]);
end;

with frmOt_Tegang_Pasca_t2 do begin
  lblht.Caption := '1. ht = ' + FloatToStr(ht);
  lblbw.Caption := '2. bw = ' + FloatToStr(bw);
  lblbof.Caption := '3. bof = ' + FloatToStr(bof);
  lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);
  lblds.Caption := '5. ds = ' + FloatToStr(ds);
  lblfps.Caption := '6. fps = ' + FloatToStr(fps);
  lblaps.Caption := '7. Aps = ' + FloatToStr(Aps);
  lbla.Caption := '8. a = ' + FloatToStr(a);
  lblb.Caption := '9. b = ' + FloatToStr(b);
  lblfc.Caption := '10. fc = ' + FloatToStr(fc);
  lblfci.Caption := '11. fci = ' + FloatToStr(fci);
  lblL.Caption := '12. L = ' + FloatToStr(L);
  lblgbeton.Caption := 'beton = ' + FloatToStr(gbeton);
  lblqh.Caption := '16. qh = ' + FloatToStr(qh);

```

## Listing Program

```

lblES.Caption := ' 13. Es = ' + FloatToStr(Es);
lblEc.Caption := ' 14. Ec = ' + FloatToStr(Ec);
lblDfps.Caption := ' fps = ' + FloatToStr(Dfps);
lblDlubang.Caption := ' lubang = ' + FloatToStr(Dlubang);

lblHasil1.Caption := Hsl1;
lblHasil2.Caption := Hsl2;
lblHasil3.Caption := Hsl3;
lblHasil4.Caption := Hsl4;
lblHasil5.Caption := Hsl5;
lblHasil6.Caption := Hsl6;
lblHasil7.Caption := Hsl7;
lblHasil8.Caption := Hsl8;
lblHasil9.Caption := Hsl9;
lblPesan1.Caption := Pesan1;
lblPesan2.Caption := Pesan2;
lblPesan3.Caption := Pesan3;
lblPesan4.Caption := Pesan4;
lblPesan5.Caption := Pesan5;
lblPesan6.Caption := Pesan6;
ShowModal;
end;

end;

procedure Ttegang_pasca_t2_2.tombolBantuanClick(Sender: TObject);
begin
    frmmenu_bantuan.ShowModal;
end;

procedure Ttegang_pasca_t2_2.tombolKembaliClick(Sender: TObject);
begin
    Close;
end;

procedure Ttegang_pasca_t2_2.tombolSimpanClick(Sender: TObject);
var
    LstSimpan: TStringList;
begin
    LstSimpan := TStringList.Create;
    LstSimpan.Add('1');
    LstSimpan.Add('2');
    LstSimpan.Add('5');
    LstSimpan.Add('2');
    LstSimpan.Add(edtht.Text);
    LstSimpan.Add(edtbw.Text);
    LstSimpan.Add(edtbof.Text);
    LstSimpan.Add(edtdfa.Text);
    LstSimpan.Add(edtds.Text);
    LstSimpan.Add(edtfps.Text);
    LstSimpan.Add(edtAps.Text);
    LstSimpan.Add(edta.Text);
    LstSimpan.Add(edtb.Text);
    LstSimpan.Add(edtfcf.Text);
    LstSimpan.Add(edtL.Text);
    LstSimpan.Add(edtgbeton.Text);
    LstSimpan.Add(edtqh.Text);
    LstSimpan.Add(edtEs.Text);
    LstSimpan.Add(edtEc.Text);
    LstSimpan.Add(edtDfps.Text);
    LstSimpan.Add(edtDlubang.Text);
    if SaveDialog1.Execute then
        LstSimpan.SaveToFile(SaveDialog1.FileName);
    LstSimpan.Free;
end;

end.

```

## Listing Program

```

unit InTegang_pra_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math, jpeg;
type
  Ttegang_pra_t2 = class(TForm)
    Label3: TLabel;
    Label6: TLabel;
    Label7: TLabel;
    Label8: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    Label11: TLabel;
    Label13: TLabel;
    Label4: TLabel;
    Label14: TLabel;
    Label15: TLabel;
    Label16: TLabel;
    Label2: TLabel;
    Label5: TLabel;
    Label19: TLabel;
    Label20: TLabel;
    Label22: TLabel;
    Label28: TLabel;
    Label29: TLabel;
    Label32: TLabel;
    Label33: TLabel;
    Label40: TLabel;
    Label12: TLabel;
    Label17: TLabel;
    Label18: TLabel;
    Label21: TLabel;
    Label23: TLabel;
    Label24: TLabel;
    Label25: TLabel;
    Label26: TLabel;
    Label27: TLabel;
    Label30: TLabel;
    Label31: TLabel;
    Label34: TLabel;
    Label35: TLabel;
    Label36: TLabel;
    Label46: TLabel;
    Label1: TLabel;
    Panel1: TPanel;
    Image1: TImage;
    edtbw: TEditEx;
    edtht: TEditEx;
    edtfci: TEditEx;
    edtL: TEditEx;
    edtEs: TEditEx;
    edtEc: TEditEx;
    edtgbeton: TEditEx;
    edtDfps: TEditEx;
    edtqh: TEditEx;
    edtdfa: TEditEx;
    edtbfo: TEditEx;
    edta: TEditEx;
    edtb: TEditEx;
    edtAps: TEditEx;
    edtds: TEditEx;
    edtfps: TEditEx;
    edtfc: TEditEx;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolSimpan: TBitBtn;
    tombolAnalisis: TBitBtn;
  end;

```



## Listing Program

```

SaveDialog1: TSaveDialog;
Label37: TLabel;
Label38: TLabel;
edtqm: TEditEx;
procedure tombolAnalisisClick(Sender: TObject);
procedure tombolBantuanClick(Sender: TObject);
procedure tombolKembaliClick(Sender: TObject);
procedure tombolSimpanClick(Sender: TObject);
private
public
end;
var
  tegang_pra_t2: Ttegang_pra_t2;
implementation
uses OtTegang_pra_t2, Menu_Bantuan;
procedure Ttegang_pra_t2.tombolAnalisisClick(Sender: TObject);
var
  ht, bw, bof, dfa, ds, fps, Aps, a, b, fc, fci, L, gbeton, qh, qm, Es, Ec, Dfps: Extended;
  At, Q, Ya, Yb, Lo, It, Fo, Br8, Br9, Br10, qbs, Mbs, Br13, Br14, Br15, Br16, Br19, F, Br21, Br22, Br23, Mbh, Br25,
  Br26, Br27, Br28, Br31: Extended;
  Hsl1, Hsl2, Hsl3, Hsl4, Hsl5, Hsl6, Pesan1, Pesan2, Pesan3, Pesan4: string;
begin
  with tegang_pra_t2 do begin
    ht := edtht.Value;
    bw := edtbw.Value;
    bof := editbof.Value;
    dfa := editdfa.Value;
    ds := editds.Value;
    fps := editfps.Value;
    Aps := edtAps.Value;
    a := edita.Value;
    b := editb.Value;
    fc := editfc.Value;
    fci := editfci.Value;
    L := editL.Value;
    gbeton := editgbeton.Value;
    qh := editqh.Value;
    qm := edtqm.Value;
    Es := editEs.Value;
    Ec := editEc.Value;
    Dfps := editDfps.Value;

    At := ((bof - bw) * dfa + bw * ht + a * b) + ((Es / Ec) - 1) * Aps;
    Q := ((bof - bw) * dfa * (dfa / 2)) + (bw * ht * (ht / 2)) + (a * b * (dfa + (b / 3))) + ((Es / Ec) - 1) * Aps * (ht - ds);
    Ya := Q / At;
    Yb := ht - Ya;
    Lo := Yb - ds;
    It := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht *
    Sqr(ht / 2)) + (2 * ((a * Power(b, 3)) / 36) + a * b * (Sqr(dfa + (b / 3))))) + ((Es / Ec) - 1) * Aps * (Sqr(ht - ds))) - At *
    Sqr(Ya);
    Fo := fps * Aps;
    Br8 := -1 * (Fo / At);
    Br9 := (Fo * Lo * Ya) / It;
    Br10 := -1 * ((Fo * Lo * Yb) / It);
    qbs := (At * gbeton * 1E-6) + qm;
    Mbs := (1 / 8) * qbs * Sqr(L);
    Br13 := -1 * ((Mbs * Ya) / It);
    Br14 := (Mbs * Yb) / It;
    Br15 := Br8 + Br9 + Br13;
    Hsl1 := '1. Tegangan awal beton tepi atas = ' + Format('%4f', [Br15]);
    Br16 := Br8 + Br10 + Br14;
    Hsl2 := '2. Tegangan awal beton tepi bawah = ' + Format('%4f', [Br16]);
    if (Br15 <= (0.25 * Sqrt(fci))) then
      Pesan1 := 'Hasil hitungan <= 0.25 Sqrt(fci) :: Sudah sesuai peraturan '
    else
      Pesan1 := 'Hasil hitungan >= 0.25 Sqrt(fci) :: Tidak sesuai peraturan '];
    if (Br16 <= (Abs(-0.6 * fci))) then
      Pesan2 := 'Hasil hitungan <= Abs(-0.6 * fci) :: Sudah sesuai peraturan '
    else
      Pesan2 := 'Hasil hitungan >= Abs(-0.6 * fci) :: Tidak sesuai peraturan '
  end;
end;

```

## Listing Program

```

else
    Pesan2 := '[ Hasil hitungan >= Abs(-0.6 * f'ci) :: Tidak sesuai peraturan ]';
    Br19 := fps + (Es / Ec) * (Br8 + (Lo / Yb) * Br10 + (Lo / Yb) * Br14);
    Hsl3 := '3. Tegangan pada baja tendon sebelum transfer = ' + Format('%.4f', [Br19]);
    F := (fps - Dfps) * Aps;
    Br21 := -1 * (F / At);
    Br22 := (F * Lo * Ya) / It;
    Br23 := -1 * ((F * Lo * Yb) / It);
    Mbh := (1 / 8) * qh * Sqr(L);
    Br25 := (-1 * (Mbh * Ya)) / It;
    Br26 := (Mbh * Yb) / It;
    Br27 := Br21 + Br22 + Br13 + Br25;
    Hsl4 := '4. Tegangan akhir beton tepi atas = ' + Format('%.4f', [Br27]);
    Br28 := Br21 + Br23 + Br14 + Br26;
    Hsl5 := '5. Tegangan akhir beton tepi bawah = ' + Format('%.4f', [Br28]);
    if (Br27 < (Abs(-0.45 * Sqr(fc)))) then
        Pesan3 := '[ Hasil hitungan < Abs(-0.45 * Sqr(fc)) :: Sudah sesuai peraturan ]'
    else
        Pesan3 := '[ Hasil hitungan > Abs(-0.45 * Sqr(fc)) :: Tidak sesuai peraturan ]';
    if (Br28 < (0.5 * Sqr(fc))) then
        Pesan4 := '[ Hasil hitungan < 0.5 * Sqr(fc) :: Sudah sesuai peraturan ]'
    else
        Pesan4 := '[ Hasil hitungan > 0.5 * Sqr(fc) :: Tidak sesuai peraturan ]';
    Br31 := (fps - dfps) + (Es / Ec) * (Br21 + (Lo / Yb) * Br23 + (Lo / Yb) * Br14 + (Lo / Yb) * Br26);
    Hsl6 := '6. Tegangan pada baja tendon setelah transfer = ' + Format('%.4f', [Br31]);
end;

with frmOt_Tegang_Pra_t2 do begin
    lblht.Caption := '1. ht = ' + FloatToStr(ht);
    lblbw.Caption := '2. bw = ' + FloatToStr(bw);
    lblbof.Caption := '3. bof = ' + FloatToStr(bof);
    lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);
    lblfs.Caption := '5. ds = ' + FloatToStr(ds);
    lblfps.Caption := '6. fps = ' + FloatToStr(fps);
    lblAps.Caption := '7. Aps = ' + FloatToStr(Aps);
    lbla.Caption := '8. a = ' + FloatToStr(a);
    lblb.Caption := '9. b = ' + FloatToStr(b);
    lblfc.Caption := '10. fc = ' + FloatToStr(fc);
    lblfci.Caption := '11. fci = ' + FloatToStr(fci);
    lblL.Caption := '12. L = ' + FloatToStr(L);
    lblgbeton.Caption := 'beton = ' + FloatToStr(gbeton);
    lblqh.Caption := '16. qh = ' + FloatToStr(qh);
    lblqm.Caption := '17. qm = ' + FloatToStr(qm);
    lblES.Caption := '13. Es = ' + FloatToStr(Es);
    lblEc.Caption := '14. Ec = ' + FloatToStr(Ec);
    lblDfps.Caption := 'fps = ' + FloatToStr(Dfps);

    lblHasil1.Caption := Hsl1;
    lblHasil2.Caption := Hsl2;
    lblHasil3.Caption := Hsl3;
    lblHasil4.Caption := Hsl4;
    lblHasil5.Caption := Hsl5;
    lblHasil6.Caption := Hsl6;
    lblPesan1.Caption := Pesan1;
    lblPesan2.Caption := Pesan2;
    lblPesan3.Caption := Pesan3;
    lblPesan4.Caption := Pesan4;
    ShowModal;
end;

procedure Ttegang_pra_t2.tombolBantuanClick(Sender: TObject);
begin
    frmmenu_bantuan.ShowModal;
end;

procedure Ttegang_pra_t2.tombolKembaliClick(Sender: TObject);
begin
    Close;
end;

```

## Listing Program

```
procedure Ttegang_pra_t2.tombolSimpanClick(Sender: TObject);
var
  LstSimpan: TStringList;
begin
  LstSimpan := TStringList.Create;
  LstSimpan.Add('1');
  LstSimpan.Add('2');
  LstSimpan.Add('5');
  LstSimpan.Add('1');

  LstSimpan.Add(edtht.Text);
  LstSimpan.Add(edlbw.Text);
  LstSimpan.Add(edtbof.Text);
  LstSimpan.Add(edtdfa.Text);
  LstSimpan.Add(edtds.Text);
  LstSimpan.Add(edtfps.Text);
  LstSimpan.Add(edtAps.Text);
  LstSimpan.Add(edta.Text);
  LstSimpan.Add(edtb.Text);
  LstSimpan.Add(edtfc.Text);
  LstSimpan.Add(edtfci.Text);
  LstSimpan.Add(edtL.Text);
  LstSimpan.Add(edtg beton.Text);
  LstSimpan.Add(edtqh.Text);
  LstSimpan.Add(edtqm.Text);
  LstSimpan.Add(edtEs.Text);
  LstSimpan.Add(edtEc.Text);
  LstSimpan.Add(edtDfps.Text);
  if SaveDialog1.Execute then
    LstSimpan.SaveToFile(SaveDialog1.FileName);
  LstSimpan.Free;
end;

end.
```

## Listing Program

```

unit OtAngkur_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, Buttons, ExtCtrls, jpeg;
type
  TOt_Angkur_t2 = class(TForm)
    Shapel: TShape;
    lblbof: TLabel;
    lblht: TLabel;
    lblbw: TLabel;
    lbldfa: TLabel;
    Label17: TLabel;
    Label23: TLabel;
    lblHasil1: TLabel;
    lblHasil2: TLabel;
    Label4: TLabel;
    Label50: TLabel;
    lbla: TLabel;
    lblb: TLabel;
    lblL: TLabel;
    lblEc: TLabel;
    lblEs: TLabel;
    lblbp: TLabel;
    lblhp: TLabel;
    lblfci: TLabel;
    lblfps: TLabel;
    lbls: TLabel;
    lblAps: TLabel;
    btnPrint: TBitBtn;
    btnKembali: TBitBtn;
    lblPesan1: TLabel;
    PrinterSetupDialog1: TPrinterSetupDialog;
    lblfy: TLabel;
    lblHasil3: TLabel;
    Image2: TImage;
    Label1: TLabel;
    lblSatu2: TLabel;
    lblSatu3: TLabel;
    procedure btnKembaliClick(Sender: TObject);
    procedure btnPrintClick(Sender: TObject);
  private
  public
  end;
var
  Ot_Angkur_t2: TOt_Angkur_t2;
implementation

procedure TOt_Angkur_t2.btnKembaliClick(Sender: TObject);
begin
  Close;
end;

procedure TOt_Angkur_t2.btnPrintClick(Sender: TObject);
begin
  if not PrinterSetupDialog1.Execute then Exit;
  btnPrint.Visible := False;
  btnKembali.Visible := False;
  Height := 395;
  Print;
end;

end.

```

## Listing Program

```

unit OtGeser_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, Buttons, ExtCtrls, jpeg;
type
  TOt_Geser_t2 = class(TForm)
    Shape1: TShape;
    lblht: TLabel;
    lblbf: TLabel;
    lblbw: TLabel;
    lbldfa: TLabel;
    Label24: TLabel;
    Label32: TLabel;
    lblDfps: TLabel;
    Label17: TLabel;
    Label23: TLabel;
    lblHasil1: TLabel;
    lblHasil2: TLabel;
    Label4: TLabel;
    Label50: TLabel;
    Label1: TLabel;
    Label2: TLabel;
    lblgbeton: TLabel;
    lblHasil3: TLabel;
    lblHasil4: TLabel;
    lbla: TLabel;
    lblb: TLabel;
    lblqh: TLabel;
    lblx: TLabel;
    lblEc: TLabel;
    lblEs: TLabel;
    lblL: TLabel;
    lblfc: TLabel;
    lblfps: TLabel;
    lbls: TLabel;
    lblAps: TLabel;
    btnPrint: TBitBtn;
    btnKembali: TBitBtn;
    PrinterSetupDialog1: TPrinterSetupDialog;
    Image2: TImage;
    Label39: TLabel;
    lblDsengakang: TLabel;
    Label7: TLabel;
    lblqm: TLabel;
    lblfpu: TLabel;
    lblfy: TLabel;
    lblHasil6: TLabel;
    lblHasil5: TLabel;
    Label3: TLabel;
    Label5: TLabel;
    Label6: TLabel;
    Label8: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    procedure btnKembaliClick(Sender: TObject);
    procedure btnPrintClick(Sender: TObject);
  private
  public
  end;
var
  Ot_Geser_t2: TOt_Geser_t2;
implementation

```

## Listing Program

```
procedure TOT_Geser_t2.btnKembaliClick(Sender: TObject);  
begin  
    Close;  
end;  
  
procedure TOT_Geser_t2.btnPrintClick(Sender: TObject);  
begin  
    if not PrinterSetupDialog1.Execute then Exit;  
    btnPrint.Visible := False;  
    btnKembali.Visible := False;  
    Height := 450;  
    Print  
end;  
  
end.
```



## Listing Program

```

unit OtKehilangan_pasca_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, Buttons, ExtCtrls, jpeg;
type
  TOt_Kehil_Pasca_t2 = class(TForm)
    Shape1: TShape;
    lblht: TLabel;
    lblbof: TLabel;
    lblbw: TLabel;
    lblAps: TLabel;
    lblds: TLabel;
    lblfps: TLabel;
    lbldfa: TLabel;
    Label28: TLabel;
    lblgbeton: TLabel;
    Label17: TLabel;
    Label23: TLabel;
    lblHasil1: TLabel;
    lblHasil2: TLabel;
    lblHasil3: TLabel;
    lblHasil4: TLabel;
    lblHasil5: TLabel;
    lblPesan1: TLabel;
    Label4: TLabel;
    Ot_Tegang_Pasca_t2: TLabel;
    lbla: TLabel;
    lblb: TLabel;
    lblH: TLabel;
    lblEc: TLabel;
    lblEs: TLabel;
    lblL: TLabel;
    lblfy: TLabel;
    lblfc: TLabel;
    btnPrint: TBitBtn;
    btnKembali: TBitBtn;
    PrinterSetupDialog1: TPrinterSetupDialog;
    Image2: TImage;
    Label2: TLabel;
    Label3: TLabel;
    Label1: TLabel;
    Label5: TLabel;
    Label6: TLabel;
    lblHasil6: TLabel;
    procedure btnKembaliClick(Sender: TObject);
    procedure btnPrintClick(Sender: TObject);
  private
  public
  end;
var
  Ot_Kehil_Pasca_t2: TOt_Kehil_Pasca_t2;
implementation
procedure TOt_Kehil_Pasca_t2.btnKembaliClick(Sender: TObject);
begin
  Close;
end;
procedure TOt_Kehil_Pasca_t2.btnPrintClick(Sender: TObject);
begin
  if not PrinterSetupDialog1.Execute then Exit;
  btnPrint.Visible := False;
  btnKembali.Visible := False;
  Height := 460;
  Print;
end;
end.

```

## Listing Program

```

unit OtKehilangan_pra_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, Buttons, ExtCtrls, jpeg;
type
  TOt_Kehil_Pra_t2 = class(TForm)
    Shape1: TShape;
    lblht: TLabel;
    lblbof: TLabel;
    lblbw: TLabel;
    lblAps: TLabel;
    lblds: TLabel;
    lblfps: TLabel;
    lbldfa: TLabel;
    Label28: TLabel;
    lblgbeton: TLabel;
    Label17: TLabel;
    Label23: TLabel;
    lblHasil1: TLabel;
    lblHasil2: TLabel;
    lblHasil3: TLabel;
    lblHasil4: TLabel;
    lblHasil5: TLabel;
    lblPesani: TLabel;
    Label4: TLabel;
    Ot_Tegang_Pasca_il: TLabel;
    lbla: TLabel;
    lblb: TLabel;
    lblH: TLabel;
    lblEc: TLabel;
    lblEs: TLabel;
    lblL: TLabel;
    lblfy: TLabel;
    lblfc: TLabel;
    btnPrint: TBitBtn;
    btnKembali: TBitBtn;
    PrinterSetupDialog1: TPrinterSetupDialog;
    Image2: TImage;
    Label2: TLabel;
    Label3: TLabel;
    Label5: TLabel;
    Label6: TLabel;
    Label1: TLabel;
    lblHasil6: TLabel;
    procedure btnPrintClick(Sender: TObject);
    procedure btnKembaliClick(Sender: TObject);
  private
  end;
  var
    Ot_Kehil_Pra_t2: TOt_Kehil_Pra_t2;
implementation
  procedure TOt_Kehil_Pra_t2.btnPrintClick(Sender: TObject);
  begin
    if not PrinterSetupDialog1.Execute then Exit;
    btnPrint.Visible := False;
    btnKembali.Visible := False;
    Height := 450;
    Print;
  end;
  procedure TOt_Kehil_Pra_t2.btnKembaliClick(Sender: TObject);
  begin
    Close;
  end;
end.

```



## Listing Program

```

unit OtLintasan_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, Buttons, ExtCtrls, jpeg;
type
  TOt_Lintasan_t2 = class(TForm)
    Shape1: TShape;
    lblht: TLabel;
    lblbof: TLabel;
    lblbw: TLabel;
    lblAps: TLabel;
    lblds: TLabel;
    lblfps: TLabel;
    lbldfa: TLabel;
    Label28: TLabel;
    lblgbeton: TLabel;
    Label17: TLabel;
    Label23: TLabel;
    bleoa1: TLabel;
    bleoa2: TLabel;
    bleoa3: TLabel;
    bleoa4: TLabel;
    bleoa5: TLabel;
    Label4: TLabel;
    Ot_Lintasan_t2: TLabel;
    Label1: TLabel;
    lblDfps: TLabel;
    bleob1: TLabel;
    bleob2: TLabel;
    bleob3: TLabel;
    bleob4: TLabel;
    bleob5: TLabel;
    lblKa: TLabel;
    lblKb: TLabel;
    lbla: TLabel;
    lblb: TLabel;
    lblH: TLabel;
    lblEc: TLabel;
    lblEs: TLabel;
    lblL: TLabel;
    lblqh: TLabel;
    btnPrint: TBitBtn;
    btnKembali: TBitBtn;
    Label25: TLabel;
    lblDlubang: TLabel;
    PrinterSetupDialog1: TPrinterSetupDialog;
    Image5: TImage;
    Image2: TImage;
    lblfc: TLabel;
    Label2: TLabel;
    Label3: TLabel;
    Label5: TLabel;
    Label6: TLabel;
    Label7: TLabel;
    Label8: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    Label11: TLabel;
    Label12: TLabel;
    Label13: TLabel;
    Label14: TLabel;
    procedure btnPrintClick(Sender: TObject);
    procedure btnKembaliClick(Sender: TObject);
  private
  public
  end;

```

## Listing Program

```
var
  Ot_Lintasan_t2: TOt_Lintasan_t2;
implementation
  procedure TOt_Lintasan_t2.btnPrintClick(Sender: TObject);
  begin
    if not PrinterSetupDialog1.Execute then Exit;
    btnPrint.Visible := False;
    btnKembali.Visible := False;
    Height := 550;
    Print;
  end;

  procedure TOt_Lintasan_t2.btnKembaliClick(Sender: TObject);
  begin
    Close;
  end;
end.
```

## Listing Program

```

unit OtMomen_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, Buttons, ExtCtrls, jpeg;
type
  TOt_Momen_t2 = class(TForm)
    Shape1: TShape;
    lblht: TLabel;
    lblbof: TLabel;
    lblbw: TLabel;
    lbldfa: TLabel;
    Label24: TLabel;
    Label32: TLabel;
    lblDfps: TLabel;
    Label17: TLabel;
    Label23: TLabel;
    Label4: TLabel;
    Ot_Momen_t2: TLabel;
    lblfpu: TLabel;
    lblfy: TLabel;
    lblfc: TLabel;
    lblfps: TLabel;
    lbls: TLabel;
    lbls1: TLabel;
    lblps: TLabel;
    lblAs1: TLabel;
    lblAss: TLabel;
    lblAps: TLabel;
    btnPrint: TBitBtn;
    btnKembali: TBitBtn;
    dd: TLabel;
    lblHasil1: TLabel;
    lblHasil2: TLabel;
    Label2: TLabel;
    lblHasil3: TLabel;
    lblHasil4: TLabel;
    PrinterSetupDialog1: TPrinterSetupDialog;
    Image2: TImage;
    lblPesan2: TLabel;
    lblPesan1: TLabel;
    Label1: TLabel;
    Label3: TLabel;
    Label5: TLabel;
    Label6: TLabel;
    procedure btnPrintClick(Sender: TObject);
    procedure btnKembaliClick(Sender: TObject);
  private
  public
  end;
var
  Ot_Momen_t2: TOt_Momen_t2;
implementation
  procedure TOt_Momen_t2.btnPrintClick(Sender: TObject);
  begin
    if not PrinterSetupDialog1.Execute then Exit;
    btnPrint.Visible := False;
    btnKembali.Visible := False;
    Height := 470;
    Print;
  end;

  procedure TOt_Momen_t2.btnKembaliClick(Sender: TObject);
  begin
    Close;
  end;
end.

```

## Listing Program

```

unit OtTegang_pasca_t1;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, Buttons, ExtCtrls, jpeg;
type
  TfrmOt_Tegang_Pasca_t1 = class(TForm)
    Shapel: TShape;
    lblht: TLabel;
    lblbof: TLabel;
    lblbw: TLabel;
    lblAps: TLabel;
    lblds: TLabel;
    lblfps: TLabel;
    lblfc: TLabel;
    lblfci: TLabel;
    lbldfa: TLabel;
    lblL: TLabel;
    lblEs: TLabel;
    lblEc: TLabel;
    lblqh: TLabel;
    Label24: TLabel;
    Label28: TLabel;
    lblgbeton: TLabel;
    Label12: TLabel;
    Label32: TLabel;
    lblDfps: TLabel;
    Label25: TLabel;
    lblDlubang: TLabel;
    lbl: TLabel;
    Label17: TLabel;
    Label23: TLabel;
    lblHasil1: TLabel;
    lblHasil2: TLabel;
    lblHasil3: TLabel;
    lblHasil4: TLabel;
    lblHasil5: TLabel;
    lblHasil6: TLabel;
    lblHasil7: TLabel;
    lblHasil8: TLabel;
    lblHasil9: TLabel;
    lblPesan1: TLabel;
    lblPesan3: TLabel;
    lblPesan2: TLabel;
    lblPesan4: TLabel;
    lblPesan5: TLabel;
    lblPesan6: TLabel;
    Label4: TLabel;
    Label50: TLabel;
    btnPrint: TBitBtn;
    btnKembali: TBitBtn;
    PrinterSetupDialog1: TPrinterSetupDialog;
    Image2: TImage;
    Label1: TLabel;
    Label2: TLabel;
    Label3: TLabel;
    Label5: TLabel;
    Label6: TLabel;
    Label7: TLabel;
    Label8: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    procedure btnKembaliClick(Sender: TObject);
    procedure btnPrintClick(Sender: TObject);
  private
  public
  end;

```

## Listing Program

```
var
  frmOt_Tegang_Pasca_t1: TfrmOt_Tegang_Pasca_t1;
implementation
  procedure TfrmOt_Tegang_Pasca_t1.btnKembaliClick(Sender: TObject);
  begin
    Close;
  end;

  procedure TfrmOt_Tegang_Pasca_t1.btnPrintClick(Sender: TObject);
  begin
    if not PrinterSetupDialog1.Execute then Exit;
    btnPrint.Visible := False;
    btnKembali.Visible := False;
    Height := 535;
    Print;
  end;
end.
```

## Listing Program

```

unit OtTegang_pra_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, Buttons, ExtCtrls, jpeg;
type
  TfrmOt_Tegang_Pra_t2 = class(TForm)
    Shape1: TShape;
    lblht: TLabel;
    lblbof: TLabel;
    lblbw: TLabel;
    lblAps: TLabel;
    lblds: TLabel;
    lblfps: TLabel;
    lblfc: TLabel;
    lblfci: TLabel;
    lbldfa: TLabel;
    lbla: TLabel;
    lblL: TLabel;
    lblEs: TLabel;
    lblEc: TLabel;
    lblqh: TLabel;
    Label24: TLabel;
    Label28: TLabel;
    lblgbeton: TLabel;
    Label32: TLabel;
    lblDfps: TLabel;
    lbl: TLabel;
    Label17: TLabel;
    Label23: TLabel;
    lblHasil1: TLabel;
    lblHasil2: TLabel;
    lblHasil3: TLabel;
    lblHasil4: TLabel;
    lblHasil5: TLabel;
    lblHasil6: TLabel;
    lblPesan1: TLabel;
    lblPesan3: TLabel;
    lblPesan2: TLabel;
    lblPesan4: TLabel;
    Label4: TLabel;
    Label50: TLabel;
    lblb: TLabel;
    btnPrint: TBitBtn;
    btnKembali: TBitBtn;
    PrinterSetupDialog1: TPrinterSetupDialog;
    lblqm: TLabel;
    Image2: TImage;
    Label2: TLabel;
    Label1: TLabel;
    Label3: TLabel;
    Label5: TLabel;
    Label6: TLabel;
    Label7: TLabel;
    procedure btnPrintClick(Sender: TObject);
  private
  end;
var
  frmOt_Tegang_Pra_t2: TfrmOt_Tegang_Pra_t2;
implementation
procedure TfrmOt_Tegang_Pra_t2.btnPrintClick(Sender: TObject);
begin
  if not PrinterSetupDialog1.Execute then Exit;
  btnPrint.Visible := False;
  btnKembali.Visible := False;
  Height := 490;
  Print;
end;
end.

```

## Listing Program

```

unit P2_InAngkur_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, jpeg;
type
  Tp2angkur_t2 = class(TForm)
    Label11: TLabel;
    Label12: TLabel;
    Label13: TLabel;
    Label19: TLabel;
    Label28: TLabel;
    Label29: TLabel;
    Panel1: TPanel;
    Label32: TLabel;
    Label31: TLabel;
    Panel2: TPanel;
    Image1: TImage;
    edtfc1: TEditEx;
    edthp: TEditEx;
    edthp: TEditEx;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolAnalisis: TBitBtn;
    procedure tombolAnalisisClick(Sender: TObject);
    procedure tombolBantuanClick(Sender: TObject);
    procedure tombolKembaliClick(Sender: TObject);
  private
  public
  end;
var
  p2angkur_t2: Tp2angkur_t2;
implementation
uses OtAngkur_t2, Menu_Bantuan, Input_Data_T_2;
procedure Tp2angkur_t2.tombolAnalisisClick(Sender: TObject);
var
  ht, ds, fps, Aps, bof, dfa, bw, L, a, b, fci, hp, bp, Es, Ec, fy: Extended;
  At, Q, Ya, Yb, Fo, Br6, Br7, Br9, Br10, Br11, Br12, Br13: Extended;
  Hsl1, Hsl2, Hsl3, Pesan1, Satu2, Satu3: string;
begin
  with p2angkur_t2 do begin
    ht := Input_Data_T2.edtht.Value;
    ds := Input_Data_T2.edtds.Value;
    fps := Input_Data_T2.edtfps.Value;
    Aps := Input_Data_T2.edtAps.Value;
    fci := edtfc1.Value;
    fy := Input_Data_T2.edtfy.Value;
    hp := edthp.Value;
    bp := edthp.Value;
    Es := Input_Data_T2.edtEs.Value;
    Ec := Input_Data_T2.edtEc.Value;
    dfa := Input_Data_T2.edtdfa.Value;
    bof := Input_Data_T2.edtbof.Value;
    bw := Input_Data_T2.edtbw.Value;
    L := Input_Data_T2.edtL.Value;
    a := Input_Data_T2.edta.Value;
    b := Input_Data_T2.edtb.Value;

    At := (bof - bw) * dfa + bw * ht + a * b + ((Es / Ec) - 1) * Aps;
    Q := (bof - bw) * dfa * (dfa / 2) + (bw * ht * (ht / 2)) + a * b * (dfa + (b / 3)) + ((Es / Ec) - 1) * Aps * (ht - ds);
    Ya := Q / At;
    Yb := ht - Ya;
    Fo := fps * Aps;
    Br6 := Fo / At;
    Br7 := Br6 * bw;
    Br9 := Fo / bp;
    Br10 := ((Br7 * Sqr(Yb)) / 2) - ((Br9 * Sqr(hp / 2)) / 2);
    Br11 := (7.2 * Br10) / (bw * Sqr(1.3 * ht));
  end;
end;

```

## Listing Program

```

Hsl1 := '1. Tegangan tarik pada daerah angkur = ' + Format('%4f', [Br11]);
if (Br11 < (0.17 * Sqrt(fci))) then
begin
    Pesan1 := '[Hasil hitungan < 0.17 * Sqrt(fci) -> Sudah sesuai peraturan]'
end
else
begin
    Pesan1 := '[Hasil hitungan > 0.17 * Sqrt(fci) -> Tidak sesuai peraturan]';
    Satu2 := 'N';
    Satu3 := 'mm2';
    Br12 := (2.6 * Br10) / (1.3 * ht);
    Hsl2 := '2. Gaya tarik pada daerah angkur = ' + Format('%4f', [Br12]);
    Br13 := Br12 / fy;
    Hsl3 := '3. Luas tulangan baja yang diperlukan = ' + Format('%4f', [Br13]);
end;
end;
with Ot_Angkur_t2 do begin
    lblht.Caption := '1. ht = ' + FloatToStr(ht);
    lblds.Caption := '6. ds = ' + FloatToStr(ds);
    lblfps.Caption := '7. fps = ' + FloatToStr(fps);
    lblAps.Caption := '5. Aps = ' + FloatToStr(Aps);
    lblfci.Caption := '8. fci = ' + FloatToStr(fci);
    lblES.Caption := '11. Es = ' + FloatToStr(Es);
    lblEc.Caption := '12. Ec = ' + FloatToStr(Ec);
    lblhp.Caption := '9. hp = ' + FloatToStr(hp);
    lblbp.Caption := '10. bp = ' + FloatToStr(bp);
    lblbw.Caption := '3. bw = ' + FloatToStr(bw);
    lblbof.Caption := '2. bof = ' + FloatToStr(bof);
    lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);
    lblL.Caption := '13. L = ' + FloatToStr(L);
    lbla.Caption := '15. a = ' + FloatToStr(a);
    lblb.Caption := '16. b = ' + FloatToStr(b);
    lblfy.Caption := '14. fy = ' + FloatToStr(fy);

    lblHasil1.Caption := Hsl1;
    lblHasil2.Caption := Hsl2;
    lblHasil3.Caption := Hsl3;
    lblPesan1.Caption := Pesan1;
    lblSatu2.Caption := Satu2;
    lblSatu3.Caption := Satu3;
    ShowModal;
end;
end;

procedure Tp2angkur_t2.tombolBantuanClick(Sender: TObject);
begin
    frmmenu_bantuan.ShowModal;
end;

procedure Tp2angkur_t2.tombolKembaliClick(Sender: TObject);
begin
    Close;
end;

end.

```



## Listing Program

```

unit P2_InGeser_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math;
type
  Tp2geser_t2 = class(TForm)
    Label18: TLabel;
    Label19: TLabel;
    Label22: TLabel;
    Label32: TLabel;
    Label33: TLabel;
    Label27: TLabel;
    Label30: TLabel;
    Label39: TLabel;
    Panel1: TPanel;
    Label40: TLabel;
    Label11: TLabel;
    edtX: TEditEx;
    edtqh: TEditEx;
    edtDfps: TEditEx;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolAnalisis: TBitBtn;
    Label47: TLabel;
    Label48: TLabel;
    edtfpv: TEditEx;
    Label53: TLabel;
    Label54: TLabel;
    Label55: TLabel;
    Label56: TLabel;
    edtDsengakang: TEditEx;
    Label13: TLabel;
    Label36: TLabel;
    edtqm: TEditEx;
    procedure tombolAnalisisClick(Sender: TObject);
    procedure tombolKembaliClick(Sender: TObject);
    procedure tombolBantuanClick(Sender: TObject);
  private
  public
  end;

var
  p2geser_t2: Tp2geser_t2;

implementation
uses OtGeser_t2, Menu_Bantuan, Input_Data_T_2, OtGeser_i2;

{$R *.DFM}

procedure Tp2geser_t2.tombolAnalisisClick(Sender: TObject);
var
  ht, bw, bof, dfa, ds, fps, Aps, a, b, fpv, fy, qm, Dsengakang,
  fc, L, x, gbeton, qh, Es, Ec, Dfps: Extended;

  At, Q, Ya, Yb, Lo, It, Fo, fpse, fpc, qbs, Vd, W, Vi, d1, d2, d, Mmax, fpe, Md, fd,
  Mcr, Vci1, Vci2, Vci, Vcw, qv, Vu, Vs, Vc, Vsmax, S1, S2, Smax1, Smax2, S,
  Avmin1, Avmin2, Av: Extended;

  Hsl1, Hsl2, Hsl3, Hsl4, Hsl5, Hsl6: string;

begin
  with p2geser_t2 do begin
    { Pindahkan data dari komponen Editbox ke memory variabel }
    ht := Input_Data_T2.edtht.Value; // 1500
    bw := Input_Data_T2.edtbw.Value; // 200
    bof := Input_Data_T2.edtbof.Value; // 1000
    dfa := Input_Data_T2.edtdfa.Value; // 200
  end;

```

## Listing Program

```

ds := Input_Data_T2.edtds.Value; // 700
fps := Input_Data_T2.edtfps.Value; // 1400
Aps := Input_Data_T2.edtAps.Value; // 200
fc := Input_Data_T2.edtfc.Value; // 40
fy := Input_Data_T2.edtfy.Value; // 40
fpu := edtfpu.Value;
x := edtx.Value; // 35
L := Input_Data_T2.edtL.Value; // 10000
gbeton := Input_Data_T2.edtgbeton.Value; // 0.000000024 (2.4E-8)
qh := edtqh.Value; // 0,0025
qm := edtqm.Value; // 0,0025
Es := Input_Data_T2.edtEs.Value; // 2000000 (2E5)
Ec := Input_Data_T2.edtEc.Value; // 29000 (2.9E4)
Dfps := edtDfps.Value; // 290
Dsengkang := edtDsengkang.Value; // 290
a := Input_Data_T2.edta.Value;
b := Input_Data_T2.edtb.Value;

{Baris No. 1}
At := (bof - bw) * dfa + bw * ht + ((Es / Ec) - 1) * Aps + a * b;

{Baris No.2}
Q := ((bof - bw) * dfa * (dfa / 2)) + (bw * ht * (ht / 2)) + (a * b * (dfa + (b / 3))) +
((Es / Ec) - 1) * Aps * (ht - ds);

{Baris No.3, 4 & 5}
Ya := Q / At;

Yb := ht - Ya;

Lo := Yb - ds;

{Baris No. 6}
It := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) +
((1 / 12) * bw * Power(ht, 3) + bw * ht * Sqr(ht / 2)) + (2 * (a * Power(b, 3) / 36) + a * b * Sqr(dfa + (b / 3))) +
((Es / Ec) - 1) * Aps * (Sqr(ht - ds))) - At * Sqr(Ya);

{Baris No 7}
fpse := fps - Dfps;

{Baris No 8}
qbs := At * gbeton * 1E-6;

{Baris No 9}
Vd := (0.5 * qbs * (L * 1E-3)) - (qbs * (x * 1E-3));

{Baris No 10}
W := (1.2 * qm) + (1.6 * qh);

{Baris No 11}
Vi := (0.5 * W * (L * 1E-3)) - (W * (x * 1E-3));

{Baris No 12}
d1 := ht - ds;
d2 := 0.8 * ht;
if d1 > d2 then
d := d1
else
d := d2;

{Baris No 13}
Mmax := (0.5 * W * (L * 1E-3) * (x * 1E-3)) - (0.5 * W * Sqr(x * 0.001));
Fo := Aps * fpse;
fpe := Abs((Fo / At) + ((Fo * Lo * Yb) / It));
Md := (0.5 * qbs * (L * 1E-3) * (x * 1E-3)) - (0.5 * qbs * Sqr(x * 0.001));
fd := (Md * 1E6 * Yb) / It;
Mcr := (It / Yb) * (0.5 * Sqr(fc) + fpe - fd) * 1E-6;
Vci1 := ((1 / 20) * Sqr(fc) * bw * d + Vd * 1E3 + (((Mcr * 1E6) * (L - (2 * x))) / ((L * x) - Sqr(x)))) * 1E-3;
Vci2 := ((1 / 7) * Sqr(fc) * bw * d) * 1E-3;

```

## Listing Program

```

if Vci1 > Vci2 then
  Vci := Vci1
else
  Vci := Vci2;

fpc := Fo / At;
Vcw := (0.3 * (Sqrt(fc) + fpc) * bw * d);
if Vci < Vcw then
  Vc := Vci
else
  Vc := Vcw;

qv := (1.2 * (qbs + qm)) + (1.6 * qh);
Vu := ((0.5 * qv * L) - (qv * x)) * 1E-3;
Vs := (Vu / 0.6) - Vc;
Vsmax := (2 / 3) * Sqrt(fc) * bw * d * 1E-3;
S1 := (2 * 0.25 * Pi * Sqrt(Dsengakang) * fy * d) / Vs;
Smax1 := 0.75 * ht;
if S1 < Smax1 then
  S2 := S1
else
  S2 := Smax1;

Smax2 := 600;
if S2 < Smax2 then
  S := S2
else
  S := Smax2;

Avmin1 := (bw * S) / (3 * fy);
Avmin2 := ((Aps * fpu * S) / (80 * fy * d)) * Sqrt(d / bw);
if Avmin1 > Avmin2 then
  Av := Avmin1
else
  Av := Avmin2;

Hsl1 := '1. Momen penyebab retak (Mcr) = ' + Format(%.4f, [Mcr]);

{Baris No 14}

Hsl2 := '2. Geser total yang dipikul oleh beton (Vc) = ' + Format(%.4f, [Vc]);

{Baris No 15}

Hsl5 := '5. Luasan melintang sengkang minimal (Avmin) = ' + Format(%.4f, [Av]);

Hsl6 := '6. Jarak sengkang maksimal (Smax) = ' + Format(%.4f, [S]);
{Baris No 16}

Hsl3 := '3. Kekuatan geser batas ultimit (Vu) = ' + Format(%.4f, [Vu]);

{Baris No 17}

Hsl4 := '4. Geser total yang dipikul baja (Vs) = ' + Format(%.4f, [Vs]);

end;

with Ot_Geser_t2 do begin
  lblht.Caption := '1. ht = ' + FloatToStr(ht);
  lblbw.Caption := '2. bw = ' + FloatToStr(bw);
  lblbof.Caption := '3. bof = ' + FloatToStr(bof);
  lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);
  lbls.Caption := '6. ds = ' + FloatToStr(ds);
  lblfps.Caption := '7. fps = ' + FloatToStr(fps);
  lblAps.Caption := '5. Aps = ' + FloatToStr(Aps);

```

## Listing Program

```
lblfc.Caption := ' 8. fc = ' + FloatToStr(fc);
lblfy.Caption := ' 21. fy = ' + FloatToStr(fy);
lblfpu.Caption := ' 20. fpu = ' + FloatToStr(fpu);
lblx.Caption := ' 12. x = ' + FloatToStr(x);
lblL.Caption := ' 9. L = ' + FloatToStr(L);
lblgbeton.Caption := 'beton = ' + FloatToStr(gbeton);
lblqh.Caption := ' 13. qh = ' + FloatToStr(qh);
lblqm.Caption := ' 13. qm = ' + FloatToStr(qm);
lblES.Caption := ' 10. Es = ' + FloatToStr(Es);
lblEc.Caption := ' 11. Ec = ' + FloatToStr(Ec);
lblDfps.Caption := 'fps = ' + FloatToStr(Dfps);
lblDsengkang.Caption := 'sengkang = ' + FloatToStr(Dsengkang);
lbla.Caption := '16. a = ' + FloatToStr(a);
lblb.Caption := '17. b = ' + FloatToStr(b);

lblHasil1.Caption := Hsl1;
lblHasil2.Caption := Hsl2;
lblHasil3.Caption := Hsl3;
lblHasil4.Caption := Hsl4;
lblHasil5.Caption := Hsl5;
lblHasil6.Caption := Hsl6;

ShowModal;
end;

end;

procedure Tp2geser_t2.tombolKembaliClick(Sender: TObject);
begin
  Close;
end;

procedure Tp2geser_t2.tombolBantuanClick(Sender: TObject);
begin
  frmmenu_bantuan.ShowModal;
end;

end.
```

## Listing Program

```

unit P2_InKehil_pasca_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math;
type
  Tp2kehil_pasca_t2 = class(TForm)
    Label40: TLabel;
    Label31: TLabel;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolAnalisis: TBitBtn;
    Label17: TLabel;
    editH: TEditEx;
    procedure tombolAnalisisClick(Sender: TObject);
    procedure tombolBantuanClick(Sender: TObject);
    procedure tombolKembaliClick(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  p2kehil_pasca_t2: Tp2kehil_pasca_t2;

implementation
uses OtKehilangan_pasca_t2, Menu_Bantuan, Input_Data_T_2;
procedure Tp2kehil_pasca_t2.tombolAnalisisClick(Sender: TObject);
var
  ht, bw, bof, dfa, ds, fps, Aps, a, b, fc, fy, L, gbeton, H, Es, Ec: Extended;
  At, Q, Ya, Yb, Lo, It, Br8, Br9, Br10, Br11, Br12, br1, br2, br3: Extended;
  Hsl1, Hsl2, Hsl3, Hsl4, Hsl5, Hsl6, Pesan1: string;
begin
  with p2kehil_pasca_t2 do begin
    ht := Input_Data_T2.edtht.Value;
    bw := Input_Data_T2.edtbw.Value;
    bof := Input_Data_T2.edtbof.Value;
    dfa := Input_Data_T2.edtdfa.Value;
    ds := Input_Data_T2.edtds.Value;
    fps := Input_Data_T2.edtfps.Value;
    Aps := Input_Data_T2.edtAps.Value;
    fc := Input_Data_T2.edtfc.Value;
    fy := Input_Data_T2.edtfy.Value;
    L := Input_Data_T2.edtL.Value;
    gbeton := Input_Data_T2.edtgbeton.Value;
    H := editH.Value;
    Es := Input_Data_T2.edtEs.Value;
    Ec := Input_Data_T2.edtEc.Value;
    a := Input_Data_T2.edta.Value;
    b := Input_Data_T2.edtb.Value;

    At := (bof - bw) * dfa + a * b + bw * ht + ((Es / Ec) - 1) * Aps;
    Q := ((bof - bw) * dfa * (dfa / 2)) + a * b * (dfa + (b / 3)) + (bw * ht * (ht / 2)) + ((Es / Ec) - 1) * Aps * (ht - ds);
    Ya := Q / At;
    Yb := ht - Ya;
    Lo := Yb - ds;
    It := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht * Sqr(ht / 2)) + ((2 * (a * Power(b, 3)) / 36) + a * b * Sqr(dfa + (b / 3))) + ((Es / Ec) - 1) * Aps * (Sqr(ht - ds))) - At * Sqr(Ya);
    Br8 := 0.5 * (Es / Ec) * (((fps * Aps) / At) + ((fps * Aps * Sqr(Lo)) / It));
    Hsl1 := '1. Kehilangan prategang akibat pemendekan elastis = ' + Format('%4f', [Br8]);
    Br9 := 0.8 * (117.21 - (1.034 * H));
    Hsl2 := '2. Kehilangan prategang akibat susut beton = ' + Format('%4f', [Br9]);
    br1 := (Aps * fps) / At;
    br2 := br1 + ((Aps * fps * Sqr(Lo)) / It);
    br3 := br1 + ((2 / 3) * (br2 - br1));
    Br10 := 1.5 * br3 * (Es / Ec);
    Hsl3 := '3. Kehilangan prategang akibat rangkai beton = ' + Format('%4f', [Br10]);
  end;
end;

```

## Listing Program

```

Br11 := 137.9 - (0.3 * 0.7 * fy) - (0.4 * Br8) - 0.2 * (Br9 + Br10);
Hsl4 := '4. Kehilangan prategang akibat relaksasi baja = ' + Format('%4f', [Br11]);
Br12 := Br8 + Br9 + Br10 + Br11;
Hsl5 := '5. Kehilangan prategang total = ' + Format('%4f', [Br12]);
Hsl6 := Format('%4f', [Br12]);
if not (Br12 <= (0.2 * fps)) then
    Pesan1 := '[ Hasil hitungan >= 0.2xfps -> Tidak sesuai peraturan ]'
else
    Pesan1 := '[ Hasil hitungan <= 0.2xfps -> Sudah sesuai peraturan ]';
end;
with Ot_Kehil_Pasca_t2 do begin
    lblht.Caption := '1. ht = ' + FloatToStr(ht);
    lbls.Caption := '5. ds = ' + FloatToStr(ds);
    lblfps.Caption := '6. fps = ' + FloatToStr(fps);
    lblAps.Caption := '7. Aps = ' + FloatToStr(Aps);
    lblfc.Caption := '8. fc = ' + FloatToStr(fc);
    lblfy.Caption := '9. fy = ' + FloatToStr(fy);
    lblL.Caption := '10. L = ' + FloatToStr(L);
    lblgbeton.Caption := 'beton = ' + FloatToStr(gbeton);
    lblES.Caption := '11. Es = ' + FloatToStr(Es);
    lblEc.Caption := '12. Ec = ' + FloatToStr(Ec);
    lblH.Caption := '13. H = ' + FloatToStr(H);
    lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);
    lblbw.Caption := '2. bw = ' + FloatToStr(bw);
    lblbof.Caption := '3. bof = ' + FloatToStr(bof);
    lbla.Caption := '15. a = ' + FloatToStr(a);
    lblb.Caption := '16. b = ' + FloatToStr(b);

    lblHasil1.Caption := Hsl1;
    lblHasil2.Caption := Hsl2;
    lblHasil3.Caption := Hsl3;
    lblHasil4.Caption := Hsl4;
    lblHasil5.Caption := Hsl5;
    lblHasil6.Caption := Hsl6;
    lblPesan1.Caption := Pesan1;
    ShowModal;
end;
end;

procedure Tp2kehil_pasca_t2.tombolBantuanClick(Sender: TObject);
begin
    frmmenu_bantuan.ShowModal;
end;

procedure Tp2kehil_pasca_t2.tombolKembaliClick(Sender: TObject);
begin
    Close;
end;
end.

```

## Listing Program

```

unit P2_InKehil_pra_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math;
type
  Tp2kehil_pra_t2 = class(TForm)
    Label17: TLabel;
    Label25: TLabel;
    Label31: TLabel;
    edtH: TEditEx;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolAnalisis: TBitBtn;
    procedure tombolAnalisisClick(Sender: TObject);
    procedure tombolBantuanClick(Sender: TObject);
    procedure tombolKembaliClick(Sender: TObject);
  private
  public
  end;
var
  p2kehil_pra_t2: Tp2kehil_pra_t2;
implementation
uses OtKehilangan_pra_t2, Menu_Bantuan, Input_Data_T_2;
procedure Tp2kehil_pra_t2.tombolAnalisisClick(Sender: TObject);
var
  ht, bw, bof, dfa, ds, fps, Aps, a, b, fc, fy, L, gbeton, H, Es, Ec: Extended;
  At, Q, Ya, Yb, Lo, It, Br8, Br9, Br10, Br11, Br12, br1, br2, br3: Extended;
  Hsl1, Hsl2, Hsl3, Hsl4, Hsl5, Hsl6, Pesan1: string;
begin
  with p2kehil_pra_t2 do begin
    ht := Input_Data_T2.edtH.Value;
    bw := Input_Data_T2.edtbw.Value;
    bof := Input_Data_T2.edtbof.Value;
    dfa := Input_Data_T2.edtdfa.Value;
    ds := Input_Data_T2.edtds.Value;
    fps := Input_Data_T2.edtfps.Value;
    Aps := Input_Data_T2.edtAps.Value;
    fc := Input_Data_T2.edtfc.Value;
    fy := Input_Data_T2.edtfy.Value;
    L := Input_Data_T2.edtL.Value;
    gbeton := Input_Data_T2.edtgbeton.Value;
    H := edtH.Value;
    Es := Input_Data_T2.edtEs.Value;
    Ec := Input_Data_T2.edtEc.Value;
    a := Input_Data_T2.edta.Value;
    b := Input_Data_T2.edtb.Value;

    At := (bof - bw) * dfa + a * b + bw * ht + ((Es / Ec) - 1) * Aps;
    Q := ((bof - bw) * dfa * (dfa / 2)) + a * b * (dfa + (b / 3)) + (bw * ht * (ht / 2)) + ((Es / Ec) - 1) * Aps * (ht - ds);
    Ya := Q / At;
    Yb := ht - Ya;
    Lo := Yb - ds;
    It := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht * Sqr(ht / 2)) + ((2 * (a * Power(b, 3)) / 36) + a * b * Sqr(dfa + (b / 3))) + ((Es / Ec) - 1) * Aps * (Sqr(ht - ds))) - At * Sqr(Ya);
    Br8 := (Es / Ec) * (((fps * Aps) / At) + ((fps * Aps * Sqr(Lo)) / It));
    Hsl1 := '1. Kehilangan prategang akibat pemendekan elastis = ' + Format('%4f', [Br8]);
    Br9 := 117.21 - (1.034 * H);
    Hsl2 := '2. Kehilangan prategang akibat susut beton = ' + Format('%4f', [Br9]);
    br1 := (Aps * fps) / At;
    br2 := br1 + ((Aps * fps * Sqr(Lo)) / It);
    br3 := br1 + ((2 / 3) * (br2 - br1));
    Br10 := 1.5 * br3 * (Es / Ec);
    Hsl3 := '3. Kehilangan prategang akibat rangkai beton = ' + Format('%4f', [Br10]);
    Br11 := 137.9 - (0.4 * Br8) - 0.2 * (Br9 + Br10);
    Hsl4 := '4. Kehilangan prategang akibat relaksasi baja = ' + Format('%4f', [Br11]);
  end;
end;

```

## Listing Program

```

Br12 := Br8 + Br9 + Br10 + Br11;
Hsl5 := '5. Kehilangan prategang total = ' + Format('%4f', [Br12]);
Hsl6 := Format('%4f', [Br12]);
if not (Br12 <= (0.25 * fps)) then
    Pesan1 := '[ Hasil hitungan >= 0.25xfps -> Tidak sesuai peraturan ]'
else
    Pesan1 := '[ Hasil hitungan <= 0.25xfps -> Sudah sesuai peraturan ]';
end;
with Ot_Kehil_Pra_t2 do begin
    lblht.Caption := '1. ht = ' + FloatToStr(ht);
    lbls.Caption := '5. ds = ' + FloatToStr(ds);
    lblfps.Caption := '6. fps = ' + FloatToStr(fps);
    lblAps.Caption := '7. Aps = ' + FloatToStr(Aps);
    lblfc.Caption := '8. fc = ' + FloatToStr(fc);
    lblfy.Caption := '9. fy = ' + FloatToStr(fy);
    lblL.Caption := '10. L = ' + FloatToStr(L);
    lblgbeton.Caption := 'beton = ' + FloatToStr(gbeton);
    lblES.Caption := '11. Es = ' + FloatToStr(Es);
    lblEc.Caption := '12. Ec = ' + FloatToStr(Ec);
    lblH.Caption := '13. H = ' + FloatToStr(H);
    lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);
    lblbw.Caption := '2. bw = ' + FloatToStr(bw);
    lblbof.Caption := '3. bof = ' + FloatToStr(bof);
    lbla.Caption := '15. a = ' + FloatToStr(a);
    lblb.Caption := '16. b = ' + FloatToStr(b);

    lblHasil1.Caption := Hsl1;
    lblHasil2.Caption := Hsl2;
    lblHasil3.Caption := Hsl3;
    lblHasil4.Caption := Hsl4;
    lblHasil5.Caption := Hsl5;
    lblHasil6.Caption := Hsl6;
    lblPesan1.Caption := Pesan1;
    ShowModal;
end;
end;

procedure Tp2kehil_pra_t2.tombolBantuanClick(Sender: TObject);
begin
    frmmenu_bantuan.ShowModal;
end;

procedure Tp2kehil_pra_t2.tombolKembaliClick(Sender: TObject);
begin
    Close;
end;

end.

```



## Listing Program

```

unit P2_InLintasan_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math;
type
  Tp2lintasan_t2 = class(TForm)
    Label13: TLabel;
    Label14: TLabel;
    Label15: TLabel;
    Label30: TLabel;
    Label31: TLabel;
    Label32: TLabel;
    Label33: TLabel;
    Label42: TLabel;
    Label44: TLabel;
    Label45: TLabel;
    Label36: TLabel;
    Label1: TLabel;
    edtqh: TEditEx;
    edtDlubang: TEditEx;
    edtDfps: TEditEx;
    Panel2: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolAnalisis: TBitBtn;
    procedure tombolAnalisisClick(Sender: TObject);
    procedure tombolBantuanClick(Sender: TObject);
    procedure tombolKembaliClick(Sender: TObject);
  private
  public
  end;
  var
    p2lintasan_t2: Tp2lintasan_t2;
  implementation
  uses OlLintasan_t2, Menu_Bantuan, Input_Data_T_2;
  procedure Tp2lintasan_t2.tombolAnalisisClick(Sender: TObject);
  var
    ht, bw, bof, dfa, ds, fps, Aps, a, b, fc, L, gbeton, qh, Es, Ec, Dfps, Dlubang: Extended;
    At, Q, Ya, Yb, Lo, It, Ka, Kb, Fo, qMin, qMax, MMin1, MMin2, MMin3, MMin4, MMin5, MMax1, MMax2, MMax3,
    MMax4, MMax5, F, Br25, Br26, Br27, Br28, Br29, Br30, Br31, Br32, Br33, Br34, Br35, Br36, Br37, Br38, eoa1, eoa2,
    eoa3, eoa4, eoa5, eob1, eob2, eob3, eob4, eob5: Extended;
  begin
    with p2lintasan_t2 do begin
      ht := Input_Data_T2.edtht.Value;
      bof := Input_Data_T2.edtbof.Value;
      bw := Input_Data_T2.edtbw.Value;
      dfa := Input_Data_T2.edtdfa.Value;
      ds := Input_Data_T2.edtds.Value;
      a := Input_Data_T2.edta.Value;
      b := Input_Data_T2.edtb.Value;
      Dlubang := edtDlubang.Value;
      L := Input_Data_T2.edtL.Value;
      gbeton := Input_Data_T2.edtgbeton.Value;
      qh := edtqh.Value;
      Es := Input_Data_T2.edtEs.Value;
      Ec := Input_Data_T2.edtEc.Value;
      Dfps := edtDfps.Value;
      fc := Input_Data_T2.edtfc.Value;
      Aps := Input_Data_T2.edtAps.Value;
      fps := Input_Data_T2.edtfps.Value;

      At := (bof - bw) * dfa + bw * ht + a * b + ((Es / Ec) - 1) * Aps;
      Q := ((bof - bw) * dfa * (dfa / 2)) + (bw * ht * (ht / 2)) + (a * b * (dfa + (b / 3))) + (Es / Ec - 1) * Aps * (ht - ds);
      Ya := Q / At;
      Yb := ht - Ya;
      Lo := Yb - ds;
    end;
  end;

```

## Listing Program

```

It := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht *
Sqr(ht / 2)) + (2 * ((a * Power(b, 3)) / 36) + (a * b * Sqr(dfa + (b / 3))) + ((Es / Ec - 1) * Aps * Sqr(ht - ds))) - At *
Sqr(Ya);
Ka := (It / At) / Yb;
Kb := (It / At) / Ya;
Fo := fps * Aps * 1E-3;
F := (fps - Dfps) * Aps * 1E-3;
qMin := At * gbeton * 1E-6;
qMax := qMin + (qh * 1E-6);

MMin1 := qMin * (((0.1 * L) * (0.9 * L)) / L) * 0.5 * L * 1E-3;
MMin2 := qMin * (((0.2 * L) * (0.8 * L)) / L) * 0.5 * L * 1E-3;
MMin3 := qMin * (((0.3 * L) * (0.7 * L)) / L) * 0.5 * L * 1E-3;
MMin4 := qMin * (((0.4 * L) * (0.6 * L)) / L) * 0.5 * L * 1E-3;
MMin5 := qMin * (((0.5 * L) * (0.5 * L)) / L) * 0.5 * L * 1E-3;
MMax1 := qMax * (((0.1 * L) * (0.9 * L)) / L) * 0.5 * L * 1E-3;
MMax2 := qMax * (((0.2 * L) * (0.8 * L)) / L) * 0.5 * L * 1E-3;
MMax3 := qMax * (((0.3 * L) * (0.7 * L)) / L) * 0.5 * L * 1E-3;
MMax4 := qMax * (((0.4 * L) * (0.6 * L)) / L) * 0.5 * L * 1E-3;
MMax5 := qMax * (((0.5 * L) * (0.5 * L)) / L) * 0.5 * L * 1E-3;

Br25 := (MMin1 / Fo);
Br26 := (MMin2 / Fo);
Br27 := (MMin3 / Fo);
Br28 := (MMin4 / Fo);
Br29 := (MMin5 / Fo);
Br30 := (MMax1 / F);
Br31 := (MMax2 / F);
Br32 := (MMax3 / F);
Br33 := (MMax4 / F);
Br34 := (MMax5 / F);
Br35 := 0.25 * Sqrt(0.75 * fc);
Br36 := 0.5 * Sqrt(fc);
Br37 := (Br36 * Ka * At) / (F * 1E3);
Br38 := (Br35 * Kb * At) / (Fo * 1E3);

eoa1 := Br25;
eoa2 := Br26;
eoa3 := Br27;
eoa4 := Br28;
eoa5 := Br29;
eob1 := Br30;
eob2 := Br31;
eob3 := Br32;
eob4 := Br33;
eob5 := Br34;
end;
with Ot_Lintasan_t2 do begin
  lblht.Caption := '1. ht = ' + FloatToStr(ht);
  lblbw.Caption := '2. bw = ' + FloatToStr(bw);
  lblbof.Caption := '3. bof = ' + FloatToStr(bof);
  lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);
  lbl ds.Caption := '5. ds = ' + FloatToStr(ds);
  lblfps.Caption := '6. fps = ' + FloatToStr(fps);
  lblAps.Caption := '7. Aps = ' + FloatToStr(Aps);
  lbla.Caption := '15. a = ' + FloatToStr(a);
  lblb.Caption := '16. b = ' + FloatToStr(b);
  lblL.Caption := '10. L = ' + FloatToStr(L);
  lblgbeton.Caption := 'beton = ' + FloatToStr(gbeton);
  lblqh.Caption := '8. qh = ' + FloatToStr(qh);
  lblES.Caption := '11. Es = ' + FloatToStr(Es);
  lblEc.Caption := '12. Ec = ' + FloatToStr(Ec);
  lblDfps.Caption := 'fps = ' + FloatToStr(Dfps);
  lblfc.Caption := '17. fc = ' + FloatToStr(fc);
  lblDlubang.Caption := 'lubang = ' + FloatToStr(Dlubang);

  bleoa1.Caption := '1. eoa1 = ' + Format('%0.4f', [eoa1]);
  bleoa2.Caption := '2. eoa2 = ' + Format('%0.4f', [eoa2]);

```

## Listing Program

```
lbleoa3.Caption := '3. eoa3 = ' + Format('%4f', [eoa3]);  
lbleoa4.Caption := '4. eoa4 = ' + Format('%4f', [eoa4]);  
lbleoa5.Caption := '5. eoa5 = ' + Format('%4f', [eoa5]);  
lbleob1.Caption := '6. eob1 = ' + Format('%4f', [eob1]);  
lbleob2.Caption := '7. eob2 = ' + Format('%4f', [eob2]);  
lbleob3.Caption := '8. eob3 = ' + Format('%4f', [eob3]);  
lbleob4.Caption := '9. eob4 = ' + Format('%4f', [eob4]);  
lbleob5.Caption := '10. eob5 = ' + Format('%4f', [eob5]);  
lblKa.Caption := '11. Ka = ' + Format('%4f', [Ka]);  
lblKb.Caption := '12. Kb = ' + Format('%4f', [Kb]);
```

```
ShowModal;  
end;
```

```
end;
```

```
procedure Tp2lintasan_t2.tombolBantuanClick(Sender: TObject);  
begin  
    frmmenu_bantuan.ShowModal;  
end;
```

```
procedure Tp2lintasan_t2.tombolKembaliClick(Sender: TObject);  
begin  
    Close;  
end;  
end.
```

## Listing Program

```

unit P2_InMomen_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons;
type
  Tp2momen_t2 = class(TForm)
    Label9: TLabel;
    Label18: TLabel;
    Label20: TLabel;
    Label32: TLabel;
    Label33: TLabel;
    Label27: TLabel;
    Label30: TLabel;
    Label41: TLabel;
    Label45: TLabel;
    Label12: TLabel;
    Label14: TLabel;
    Label15: TLabel;
    Label16: TLabel;
    Label17: TLabel;
    Label19: TLabel;
    Label21: TLabel;
    Label22: TLabel;
    Label1: TLabel;
    Panel1: TPanel;
    Image1: TImage;
    edtAs1: TEditEx;
    edtAss: TEditEx;
    edtdps: TEditEx;
    edtds1: TEditEx;
    edtds: TEditEx;
    edtfpu: TEditEx;
    edtDfps: TEditEx;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolAnalisis: TBitBtn;
    procedure tombolKembaliClick(Sender: TObject);
    procedure tombolBantuanClick(Sender: TObject);
    procedure tombolAnalisisClick(Sender: TObject);
  private
  public
  end;
var
  p2momen_t2: Tp2momen_t2;
implementation
uses OtMomen_t2, Menu_Bantuan, Input_Data_T_2;

procedure Tp2momen_t2.tombolKembaliClick(Sender: TObject);
begin
  Close;
end;

procedure Tp2momen_t2.tombolBantuanClick(Sender: TObject);
begin
  frmmenu_bantuan.ShowModal;
end;

procedure Tp2momen_t2.tombolAnalisisClick(Sender: TObject);
var
  ht, bof, dfa, bw, ds, ds1, dps, fps, Aps, Ass, As1, fc, fy, fpu, Dfps: Extended;
  rp, fp, wp, w, w1, wtot, T, a1, a2, Mn, Mn2, Mu, Mu2, Tp, Ts, Ttotal, g, z, Br11, Br12, Br13, Apf, Apw, rpw, wpw,
  Mbadan, Msayap, Mn3, Mu3: Extended;
  Hsl1, Hsl2, Hsl3, Hsl4, Pesan1, Pesan2: string;
begin
  with p2momen_t2 do begin
    ht := Input_Data_T2.edtht.Value;
    ds := edtds.Value;
  end;
end;

```

## Listing Program

```

fps := Input_Data_T2.edtfps.Value;
Aps := Input_Data_T2.edtAps.Value;
fc := Input_Data_T2.edtfc.Value;
Ass := edtAss.Value;
Asl := edtAsl.Value;
fy := Input_Data_T2.edtfy.Value;
fpu := edtfpu.Value;
dsl := edtdsl.Value;
dps := edtdps.Value;
Dfps := edtDfps.Value;
bw := Input_Data_T2.edtbw.Value;
dfa := Input_Data_T2.edtdfa.Value;
bof := Input_Data_T2.edtbof.Value;

rp := Aps / (bof * dps);
fp := fpu * (1 - (0.5 * rp * (fpu / fc)));
wp := (rp * fp) / fc;
w := (Ass * fy) / (bof * ds * fc);
w1 := (Asl * fy) / (bof * dsl * fc);
wtot := wp + w - w1;
if wtot > 0.3 then
  Pesan1 := 'Rasio penulangan tidak sesuai peraturan ( perkecil luasan tulangan non prategang )'
else
  Pesan1 := 'Rasio penulangan sudah sesuai peraturan';

T := Aps * fp;
a1 := (T) / (0.85 * fc * bof);
if a1 < dfa then
begin
  Pesan2 := 'Balok dianalisis sebagai balok tampang persegi';
  Mn := (T * (dps - (0.5 * a1))) * 1E-6;
  Mu := 0.9 * Mn;
  Hsl1 := '1. Momen nominal (Mn) = ' + Format('%4f', [Mn]);
  Hsl2 := '2. Momen ultimit (Mu) = ' + Format('%4f', [Mu]);

  Br11 := (fps - Dfps) + 69 + ((1.4 * fc) / (100 * rp));
  Br12 := 0.5 * (bw * (0.5 * ht));
  Br13 := 0.004 * Br12;
  Tp := Br11 * Aps;
  Ts := fy * Br13;
  Ttotal := Tp + Ts;
  g := ((Tp * (ht - dps)) + (Ts * 50)) / Ttotal;
  a2 := (Ttotal) / (0.85 * fc * bof);
  z := ht - (0.5 * a2) - g;
  Mn2 := (Ttotal * z) * 1E-6;
  Mu2 := 0.9 * Mn2;
  Hsl3 := '1. Momen nominal (Mn) = ' + Format('%4f', [Mn2]);
  Hsl4 := '2. Momen ultimit (Mu) = ' + Format('%4f', [Mu2]);
end
else
  Pesan2 := 'Balok dianalisis sebagai balok tampang T';
begin
  Apf := (0.85 * fc * (bof - bw) * dfa) / fp;
  Apw := Aps - Apf;
  rpw := Apw / (bw * dps);
  wpw := (rpw * fp) / fc;
  Mbadan := Apw * fp * (dps - (0.5 * a1));
  Msayap := 0.85 * fc * (bof - bw) * dfa * (dps - (0.5 * dfa));
  Mn3 := (Mbadan + Msayap) * 1E-6;
  Mu3 := 0.9 * Mn3;
  Hsl1 := '1. Momen nominal (Mn) = ' + Format('%4f', [Mn3]);
  Hsl2 := '2. Momen ultimit (Mu) = ' + Format('%4f', [Mu3]);

  Br11 := (fps - Dfps) + 69 + ((1.4 * fc) / (100 * rp));
  Br12 := 0.5 * (bw * (0.5 * ht));
  Br13 := 0.004 * Br12;
  Tp := Br11 * Aps;
  Ts := fy * Br13;
  Ttotal := Tp + Ts;

```

## Listing Program

```

g := ((Tp * (ht - dps)) + (Ts * 50)) / Ttotal;
a2 := (Ttotal) / (0.85 * fc * bof);
z := ht - (0.5 * a2) - g;
Mn2 := (Ttotal * z) * 1E-6;
Mu2 := 0.9 * Mn2;
Hsl3 := '1. Momen nominal (Mn) = ' + Format('%4f', [Mn2]);
Hsl4 := '2. Momen ultimit (Mu) = ' + Format('%4f', [Mu2]);
end;
end;
with Ot_Momen_t2 do begin
  lblht.Caption := '1. ht = ' + FloatToStr(ht);
  lbls.Caption := '10. ds = ' + FloatToStr(ds);
  lblfps.Caption := '11. fps = ' + FloatToStr(fps);
  lblAps.Caption := '5. Aps = ' + FloatToStr(Aps);
  lblfc.Caption := '12. fc = ' + FloatToStr(fc);
  lblfy.Caption := '13. fy = ' + FloatToStr(fy);
  lblfpu.Caption := '14. fpu = ' + FloatToStr(fpu);
  lbls1.Caption := '9. ds1 = ' + FloatToStr(ds1);
  lblsps.Caption := '8. dps = ' + FloatToStr(dps);
  lblAss.Caption := '6. As = ' + FloatToStr(Ass);
  lblAs1.Caption := '7. As1 = ' + FloatToStr(As1);
  lblDfps.Caption := 'fps = ' + FloatToStr(Dfps);
  lblbw.Caption := '2. bw = ' + FloatToStr(bw);
  lblbof.Caption := '3. bof = ' + FloatToStr(bof);
  lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);

  lblHasil1.Caption := Hsl1;
  lblHasil2.Caption := Hsl2;
  lblHasil3.Caption := Hsl3;
  lblHasil4.Caption := Hsl4;
  lblPesan1.Caption := Pesan1;
  lblPesan2.Caption := Pesan2;
  ShowModal;
end;
end;
end.

```

## Listing Program

```

unit P2_InTegang_pasca_t2_2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math;
type
  Tp2tegang_pasca_t2_2 = class(TForm)
    Label13: TLabel;
    Label18: TLabel;
    Label12: TLabel;
    Label17: TLabel;
    Label19: TLabel;
    Label41: TLabel;
    Label44: TLabel;
    Label49: TLabel;
    Label24: TLabel;
    Label31: TLabel;
    edtfc: TEditEx;
    edtDlubang: TEditEx;
    edtqh: TEditEx;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolAnalisis: TBitBtn;
    procedure tombolAnalisisClick(Sender: TObject);
    procedure tombolBantuanClick(Sender: TObject);
    procedure tombolKembaliClick(Sender: TObject);
  private
  public
  end;
var
  p2tegang_pasca_t2_2: Tp2tegang_pasca_t2_2;
implementation
uses OtTegang_pascat2, Menu_Bantuan, Input_Data_T_2, OtKehilangan_pasca_t2;

procedure Tp2tegang_pasca_t2_2.tombolAnalisisClick(Sender: TObject);
var
  ht, bw, bof, dfa, ds, fps, Aps, a, b, fc, fci, L, gbeton, qh, Es, Ec, Dfps, Dlubang: Extended;
  At, Q, Ya, Yb, Lo, It, Fo, Br8, Br9, Br10, qbs, Mbs, Br13, Br14, Br15, Br16, Br19, F, Br21, Br22, Br23, Mbh, Br25, Br26,
  Br27, Br28, Br31, At2, Q2, Ya2, Yb2, Lo2, It2, Br38, Br39, Br40, Br41, Br44: Extended;
  Hsl1, Hsl2, Hsl3, Hsl4, Hsl5, Hsl6, Hsl7, Hsl8, Hsl9, Pesan1, Pesan2, Pesan3, Pesan4, Pesan5, Pesan6: string;
begin
  if (Ot_Kehil_Pasca_t2.lblHasil6.Caption = '') then begin
    MessageBox(Handle, 'Anda Harus Melakukan Analisis Kehilangan Prategang Terlebih Dahulu !', 'Analisis Balok Beton
    Prategang', MB_ICONASTERISK or MB_OK);
    Exit;
  end;
  with p2tegang_pasca_t2_2 do begin
    ht := Input_Data_T2.edtht.Value;
    bw := Input_Data_T2.edtbw.Value;
    bof := Input_Data_T2.edtbof.Value;
    dfa := Input_Data_T2.edtdfa.Value;
    ds := Input_Data_T2.edtds.Value;
    fps := Input_Data_T2.edtfps.Value;
    Aps := Input_Data_T2.edtAps.Value;
    a := Input_Data_T2.edta.Value;
    b := Input_Data_T2.edtb.Value;
    fc := Input_Data_T2.edtfc.Value;
    fci := edtfci.Value;
    L := Input_Data_T2.edtL.Value;
    gbeton := Input_Data_T2.edtgbeton.Value;
    qh := edtqh.Value;
    Es := Input_Data_T2.edtEs.Value;
    Ec := Input_Data_T2.edtEc.Value;
    Dfps := StrToFloat(Ot_Kehil_Pasca_t2.lblHasil6.Caption);
    Dlubang := edtDlubang.Value;
  end;

```

## Listing Program

```

At := ((bof - bw) * dfa + bw * ht + a * b) - (1 / 4) * Pi * (Sqr(Dlubang));
Q := ((bof - bw) * dfa * (dfa / 2)) + (bw * ht * (ht / 2)) + (a * b * (dfa + (b / 3))) - ((1 / 4) * Pi * (Sqr(Dlubang)) * (ht - ds));
Ya := Q / At;
Yb := ht - Ya;
Lo := Yb - ds;
It := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht * Sqr(ht / 2)) + (2 * ((a * Power(b, 3)) / 36) + a * b * (Sqr(dfa + (b / 3))))) - (((1 / 4) * Pi * (Power(Dlubang / 2, 4)) + ((1 / 4) * Pi * Sqr(Dlubang)) * (ht - ds))) - At * Sqr(Ya));
Baris No 7)
Fo := fps * Aps;
Br8 := -1 * (Fo / At);
Br9 := (Fo * Lo * Ya) / It;
Br10 := -1 * ((Fo * Lo * Yb) / It);
qbs := At * gbeton * 1E-6;
Mbs := (1 / 8) * qbs * Sqr(L);
Br13 := -1 * ((Mbs * Ya) / It);
Br14 := (Mbs * Yb) / It;
Br15 := Br8 + Br9 + Br13;
Hsl1 := '1. Tegangan awal beton tepi atas = ' + Format('%4f', [Br15]);
Br16 := Br8 + Br10 + Br14;
Hsl2 := '2. Tegangan awal beton tepi bawah = ' + Format('%4f', [Br16]);

if (Br15 <= (0.25 * Sqrt(fci))) then
  Pesan1 := 'Hasil hitungan <= 0.25 Sqrt(fci) :: Sudah sesuai peraturan '
else
  Pesan1 := 'Hasil hitungan >= 0.25 Sqrt(fci) :: Tidak sesuai peraturan '
  if (Br16 <= (Abs(-0.6 * fci))) then
    Pesan2 := 'Hasil hitungan <= Abs(-0.6 * fci) :: Sudah sesuai peraturan '
  else
    Pesan2 := 'Hasil hitungan >= Abs(-0.6 * fci) :: Tidak sesuai peraturan '
  Br19 := fps + (Es / Ec) * (Br8 + (Lo / Yb) * Br10 + (Lo / Yb) * Br14);
  Hsl3 := '3. Tegangan pada baja tendon sebelum transfer = ' + Format('%4f', [Br19]);
  F := (fps - dfps) * Aps;
  Br21 := -1 * (F / At);
  Br22 := (F * Lo * Ya) / It;
  Br23 := -1 * ((F * Lo * Yb) / It);
  Mbh := (1 / 8) * qh * Sqr(L);
  Br25 := (-1 * (Mbh * Ya)) / It;
  Br26 := (Mbh * Yb) / It;
  Br27 := Br21 + Br22 + Br13 + Br25;
  Hsl4 := '4. Tegangan akhir beton tepi atas tanpa grouting = ' + Format('%4f', [Br27]);
  Br28 := Br21 + Br23 + Br14 + Br26;
  Hsl5 := '5. Tegangan akhir beton tepi bawah tanpa grouting = ' + Format('%4f', [Br28]);

if (Br27 < (Abs(-0.45 * Sqrt(fc)))) then
  Pesan3 := 'Hasil hitungan < Abs(-0.45 * Sqrt(fc)) :: Sudah sesuai peraturan '
else
  Pesan3 := 'Hasil hitungan > Abs(-0.45 * Sqrt(fc)) :: Tidak sesuai peraturan '
  if (Br28 < (0.5 * Sqrt(fc))) then
    Pesan4 := 'Hasil hitungan < 0.5 * Sqrt(fc) :: Sudah sesuai peraturan '
  else
    Pesan4 := 'Hasil hitungan > 0.5 * Sqrt(fc) :: Tidak sesuai peraturan '
  Br31 := (fps - dfps) + (Es / Ec) * (Br21 + (Lo / Yb) * Br23 + (Lo / Yb) * Br14 + (Lo / Yb) * Br26);
  Hsl6 := '6. Tegangan pada baja tendon setelah transfer tanpa grouting = ' + Format('%4f', [Br31]);
  At2 := (bof - bw) * dfa + bw * ht + a * b + ((Es / Ec) - 1) * Aps;
  Q2 := ((bof - bw) * dfa * (dfa / 2)) + (a * b * (dfa + (b / 3))) + (((Es / Ec) - 1) * Aps * (ht - ds));
  Ya2 := Q2 / At2;
  Yb2 := ht - Ya2;
  Lo2 := Yb2 - ds;
  It2 := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht * Sqr(ht / 2)) + (2 * ((a * Power(b, 3)) / 36) + a * b * (Sqr(dfa + (b / 3))))) + (((Es / Ec) - 1) * Aps * (Sqr(ht - ds))) - (At2 * Sqr(Ya2));
  Br38 := (-1 * (Mbh * Ya2)) / It2;
  Br39 := (Mbh * Yb2) / It2;
  Br40 := Br21 + Br22 + Br13 + Br38;
  Hsl7 := '7. Tegangan akhir beton tepi atas dengan grouting = ' + Format('%4f', [Br40]);
  Br41 := Br21 + Br23 + Br14 + Br39;
  Hsl8 := '8. Tegangan akhir beton tepi bawah dengan grouting = ' + Format('%4f', [Br41]);

```



## Listing Program

```

    if (Br40 < (Abs(-0.45 * Sqrt(fc)))) then
        Pesan5 := '[ Hasil hitungan < Abs(-0.45 * Sqrt(fc)) :: Sudah sesuai peraturan ]'
    else
        Pesan5 := '[ Hasil hitungan > Abs(-0.45 * Sqrt(fc)) :: Tidak sesuai peraturan ]';
    if (Br41 < (0.5 * Sqrt(fc))) then
        Pesan6 := '[ Hasil hitungan < 0.5 * Sqrt(fc) :: Sudah sesuai peraturan ]'
    else
        Pesan6 := '[ Hasil hitungan > 0.5 * Sqrt(fc) :: Tidak sesuai peraturan ]';
    Br44 := (fps - Dfps) + (Es / Ec) * (Br21 + (Lo / Yb) * Br23 + (Lo / Yb) * Br14 + (Lo2 / Yb2) * Br39);
    Hsl9 := '9. Tegangan pada baja setelah transfer dengan grouting = ' + Format('%4f', [Br44]);
end;
with frmOt_Tegang_Pasca_t2 do begin
    lblht.Caption := '1. ht = ' + FloatToStr(ht);
    lblbw.Caption := '2. bw = ' + FloatToStr(bw);
    lblbof.Caption := '3. bof = ' + FloatToStr(bof);
    lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);
    lblds.Caption := '5. ds = ' + FloatToStr(ds);
    lblfps.Caption := '6. fps = ' + FloatToStr(fps);
    lblAps.Caption := '7. Aps = ' + FloatToStr(Aps);
    lbla.Caption := '8. a = ' + FloatToStr(a);
    lblb.Caption := '9. b = ' + FloatToStr(b);
    lblfc.Caption := '10. fc = ' + FloatToStr(fc);
    lblfci.Caption := '11. fci = ' + FloatToStr(fci);
    lblL.Caption := '12. L = ' + FloatToStr(L);
    lblgbeton.Caption := 'beton = ' + FloatToStr(gbeton);
    lblqh.Caption := '16. qh = ' + FloatToStr(qh);
    lblES.Caption := '13. Es = ' + FloatToStr(Es);
    lblEc.Caption := '14. Ec = ' + FloatToStr(Ec);
    lblDfps.Caption := 'fps = ' + FloatToStr(Dfps);
    lblDlubang.Caption := 'lubang = ' + FloatToStr(Dlubang);

    lblHasil1.Caption := Hsl1;
    lblHasil2.Caption := Hsl2;
    lblHasil3.Caption := Hsl3;
    lblHasil4.Caption := Hsl4;
    lblHasil5.Caption := Hsl5;
    lblHasil6.Caption := Hsl6;
    lblHasil7.Caption := Hsl7;
    lblHasil8.Caption := Hsl8;
    lblHasil9.Caption := Hsl9;
    lblPesan1.Caption := Pesan1;
    lblPesan2.Caption := Pesan2;
    lblPesan3.Caption := Pesan3;
    lblPesan4.Caption := Pesan4;
    lblPesan5.Caption := Pesan5;
    lblPesan6.Caption := Pesan6;
    ShowModal;
end;

end;

procedure Tp2tegang_pasca_t2_2.tombolBantuanClick(Sender: TObject);
begin
    frmmenu_bantuan.ShowModal;
end;

procedure Tp2tegang_pasca_t2_2.tombolKembaliClick(Sender: TObject);
begin
    Close;
end;

end.

```

## Listing Program

```

unit P2_InTegang_pra_t2;
interface
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls, EditEx, Buttons, Math;
type
  Tp2tegang_pra_t2 = class(TForm)
    Label13: TLabel;
    Label20: TLabel;
    Label17: TLabel;
    Label36: TLabel;
    Label46: TLabel;
    Label1: TLabel;
    editfci: TEditEx;
    editqh: TEditEx;
    Panel3: TPanel;
    tombolKembali: TBitBtn;
    tombolBantuan: TBitBtn;
    tombolAnalisis: TBitBtn;
    Label37: TLabel;
    Label38: TLabel;
    editqm: TEditEx;
    procedure tombolAnalisisClick(Sender: TObject);
    procedure tombolBantuanClick(Sender: TObject);
    procedure tombolKembaliClick(Sender: TObject);
  private
  public
  end;
var
  p2tegang_pra_t2: Tp2tegang_pra_t2;
implementation
uses OtTegang_pra_t2, Menu_Bantuan, Input_Data_T_2, OtKehilangan_pra_t2;
procedure Tp2tegang_pra_t2.tombolAnalisisClick(Sender: TObject);
var
  ht, bw, bof, dfa, ds, fps, Aps, a, b, fci, L, gbeton, qh, qm, Es, Ec, Dfps: Extended;
  At, Q, Ya, Yb, Lo, It, Fo, Br8, Br9, Br10, qbs, Mbs, Br13, Br14, Br15, Br16, Br19, F, Br21, Br22, Br23, Mbh, Br25,
  Br26, Br27, Br28, Br31: Extended;
  Hsl1, Hsl2, Hsl3, Hsl4, Hsl5, Hsl6, Pesan1, Pesan2, Pesan3, Pesan4: string;
begin
  if (Ot_Kehil_Pra_t2.lblHasil6.Caption = '0') then begin
    MessageBox(Handle, 'Anda Harus Melakukan Analisis Kehilangan Prategang Terlebih Dahulu !', 'Analisis Balok Beton
    Prategang', MB_ICONASTERISK or MB_OK);
    Exit;
  end;
  with p2tegang_pra_t2 do begin
    { Pindahkan data dari komponen Editbox ke memory variabel }
    ht := Input_Data_T2.edtht.Value;
    bw := Input_Data_T2.edtbw.Value;
    bof := Input_Data_T2.edtbof.Value;
    dfa := Input_Data_T2.edtdfa.Value;
    ds := Input_Data_T2.edtds.Value;
    fps := Input_Data_T2.edtfps.Value;
    Aps := Input_Data_T2.edtAps.Value;
    a := Input_Data_T2.edta.Value;
    b := Input_Data_T2.edtb.Value;
    fci := Input_Data_T2.edtfc.Value;
    fci := editfci.Value;
    L := Input_Data_T2.edtL.Value;
    gbeton := Input_Data_T2.edtgbeton.Value;
    qh := editqh.Value;
    qm := editqm.Value;
    Es := Input_Data_T2.edtEs.Value;
    Ec := Input_Data_T2.edtEc.Value;
    Dfps := StrToFloat(Ot_Kehil_Pra_t2.lblHasil6.Caption);

    At := ((bof - bw) * dfa + bw * ht + a * b) * ((Es / Ec) - 1) * Aps;
    Q := ((bof - bw) * dfa * (dfa / 2)) + (bw * ht * (ht / 2)) + (a * b * (dfa + (b / 3))) + ((Es / Ec) - 1) * Aps * (ht - ds);
    Ya := Q / At;
  end;
end;

```

## Listing Program

```

Yb := ht - Ya;
Lo := Yb - ds;
It := (((1 / 12) * (bof - bw) * Power(dfa, 3) + (bof - bw) * dfa * Sqr(dfa / 2)) + ((1 / 12) * bw * Power(ht, 3) + bw * ht * Sqr(ht / 2)) + (2 * ((a * Power(b, 3)) / 36) + a * b * (Sqr(dfa + (b / 3)))) + ((Es / Ec) - 1) * Aps * (Sqr(ht - ds))) - At * Sqr(Ya);
Fo := fps * Aps;
Br8 := -1 * (Fo / At);
Br9 := (Fo * Lo * Ya) / It;
Br10 := -1 * ((Fo * Lo * Yb) / It);
qbs := (At * gbeton * lE-6) + qm;
Mbs := (1 / 8) * qbs * Sqr(L);
Br13 := -1 * ((Mbs * Ya) / It);
Br14 := (Mbs * Yb) / It;
Br15 := Br8 + Br9 + Br13;
Hsl1 := '1. Tegangan awal beton tepi atas = ' + Format('%4f', [Br15]);
Br16 := Br8 + Br10 + Br14;
Hsl2 := '2. Tegangan awal beton tepi bawah = ' + Format('%4f', [Br16]);

if (Br15 <= (0.25 * Sqrt(fci))) then
  Pesan1 := 'Hasil hitungan <= 0.25 Sqrt(fci) :: Sudah sesuai peraturan '
else
  Pesan1 := 'Hasil hitungan >= 0.25 Sqrt(fci) :: Tidak sesuai peraturan '
endif

if (Br16 <= (Abs(-0.6 * fci))) then
  Pesan2 := 'Hasil hitungan <= Abs(-0.6 * fci) :: Sudah sesuai peraturan '
else
  Pesan2 := 'Hasil hitungan >= Abs(-0.6 * fci) :: Tidak sesuai peraturan '
endif

Br19 := fps + (Es / Ec) * (Br8 + (Lo / Yb) * Br10 + (Lo / Yb) * Br14);
Hsl3 := '3. Tegangan pada baja tendon sebelum transfer = ' + Format('%4f', [Br19]);
F := (fps - dfps) * Aps;
Br21 := -1 * (F / At);
Br22 := (F * Lo * Ya) / It;
Br23 := -1 * ((F * Lo * Yb) / It);
Mbh := (1 / 8) * qh * Sqr(L);
Br25 := (-1 * (Mbh * Ya)) / It;
Br26 := (Mbh * Yb) / It;
Br27 := Br21 + Br22 + Br13 + Br25;
Hsl4 := '4. Tegangan akhir beton tepi atas = ' + Format('%4f', [Br27]);
Br28 := Br21 + Br23 + Br14 + Br26;
Hsl5 := '5. Tegangan akhir beton tepi bawah = ' + Format('%4f', [Br28]);

if (Br27 < (Abs(-0.45 * Sqrt(fc)))) then
  Pesan3 := 'Hasil hitungan < Abs(-0.45 * Sqrt(fc)) :: Sudah sesuai peraturan '
else
  Pesan3 := 'Hasil hitungan > Abs(-0.45 * Sqrt(fc)) :: Tidak sesuai peraturan '
endif

if (Br28 < (0.5 * Sqrt(fc))) then
  Pesan4 := 'Hasil hitungan < 0.5 * Sqrt(fc) :: Sudah sesuai peraturan '
else
  Pesan4 := 'Hasil hitungan > 0.5 * Sqrt(fc) :: Tidak sesuai peraturan '
endif
Br31 := (fps - dfps) + (Es / Ec) * (Br21 + (Lo / Yb) * Br23 + (Lo / Yb) * Br14 + (Lo / Yb) * Br26);
Hsl6 := '6. Tegangan pada baja tendon setelah transfer = ' + Format('%4f', [Br31]);
end;

with frmOt_Tegang_Pra_t2 do begin
  lblht.Caption := '1. ht = ' + FloatToStr(ht);
  lblbw.Caption := '2. bw = ' + FloatToStr(bw);
  lblbof.Caption := '3. bof = ' + FloatToStr(bof);
  lbldfa.Caption := '4. dfa = ' + FloatToStr(dfa);
  lbllds.Caption := '5. ds = ' + FloatToStr(ds);
  lblfps.Caption := '6. fps = ' + FloatToStr(fps);
  lblAps.Caption := '7. Aps = ' + FloatToStr(Aps);
  lbla.Caption := '8. a = ' + FloatToStr(a);
  lblb.Caption := '9. b = ' + FloatToStr(b);
  lblfc.Caption := '10. fc = ' + FloatToStr(fc);
  lblfci.Caption := '11. fci = ' + FloatToStr(fci);
  lblL.Caption := '12. L = ' + FloatToStr(L);
  lblgbeton.Caption := 'beton = ' + FloatToStr(gbeton);
  lblqh.Caption := '16. qh = ' + FloatToStr(qh);
end;

```

## Listing Program

```
lblqm.Caption := '17. qm = ' + FloatToStr(qm);  
lblES.Caption := '13. Es = ' + FloatToStr(Es);  
lblEc.Caption := '14. Ec = ' + FloatToStr(Ec);  
lblDfps.Caption := ' fps = ' + FloatToStr(Dfps);  
  
lblHasil1.Caption := Hsl1;  
lblHasil2.Caption := Hsl2;  
lblHasil3.Caption := Hsl3;  
lblHasil4.Caption := Hsl4;  
lblHasil5.Caption := Hsl5;  
lblHasil6.Caption := Hsl6;  
lblPesan1.Caption := Pesan1;  
lblPesan2.Caption := Pesan2;  
lblPesan3.Caption := Pesan3;  
lblPesan4.Caption := Pesan4;  
ShowModal;  
end;  
end;  
  
procedure Tp2tegang_pra_t2.tombolBantuanClick(Sender: TObject);  
begin  
    frmmenu_bantuan.ShowModal;  
end;  
  
procedure Tp2tegang_pra_t2.tombolKembaliClick(Sender: TObject);  
begin  
    Close;  
end;  
end.
```